VOL. XXIII. Nº6. JUNE 1938

MECCANO MAGAZINE

LIFT BRIDGE AT NILE BARRAGE

6D.

MECCANO

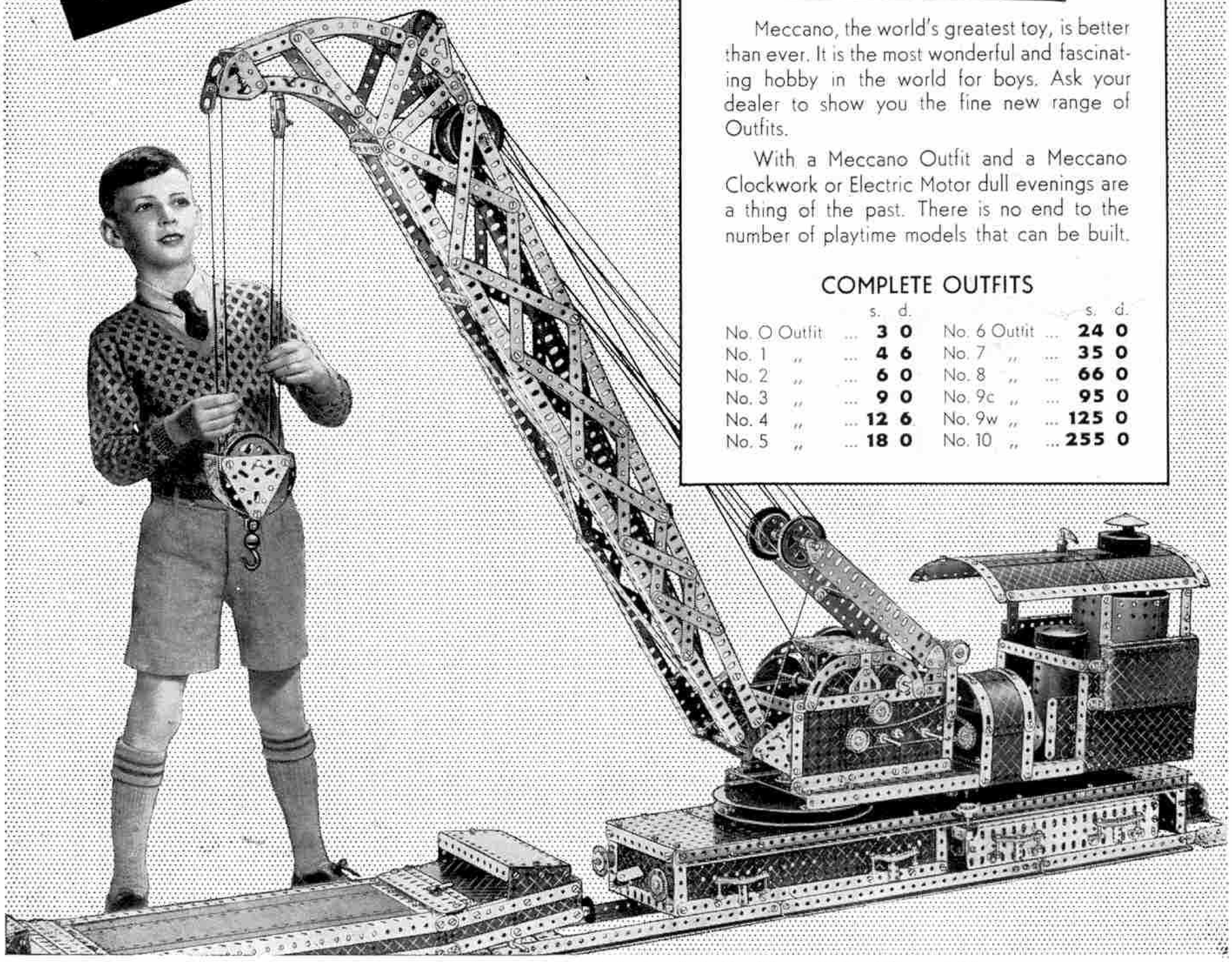
BIGGER OUTFITS . . . BETTER MODELS!

Meccano, the world's greatest toy, is better than ever. It is the most wonderful and fascinating hobby in the world for boys. Ask your dealer to show you the fine new range of Outfits.

With a Meccano Outfit and a Meccano Clockwork or Electric Motor dull evenings are a thing of the past. There is no end to the number of playtime models that can be built.

COMPLETE OUTFITS

	s.	d.		s.	d.
No. O Outfit ...	**3**	**0**	No. 6 Outfit ...	**24**	**0**
No. 1 „ ...	**4**	**6**	No. 7 „ ...	**35**	**0**
No. 2 „ ...	**6**	**0**	No. 8 „ ...	**66**	**0**
No. 3 „ ...	**9**	**0**	No. 9c „ ...	**95**	**0**
No. 4 „ ...	**12**	**6**	No. 9w „ ...	**125**	**0**
No. 5 „ ...	**18**	**0**	No. 10 „ ...	**255**	**0**

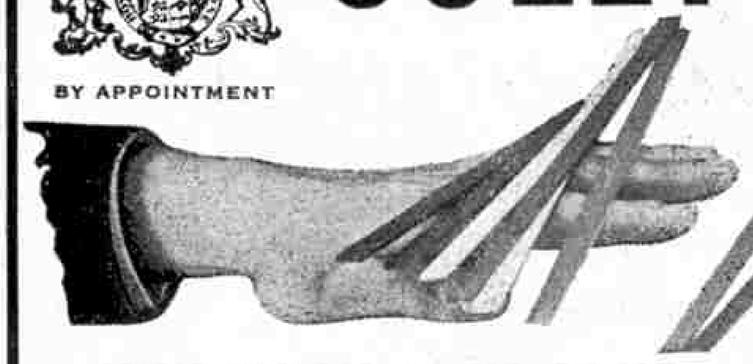


Meccano Outfits from No. 8 upwards can be purchased also through the New Meccano Deferred Payments Scheme. Ask your dealer for full particulars. (Scheme not available outside Great Britain and Northern Ireland.)

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

JOLLY GAMES for ALL AGES

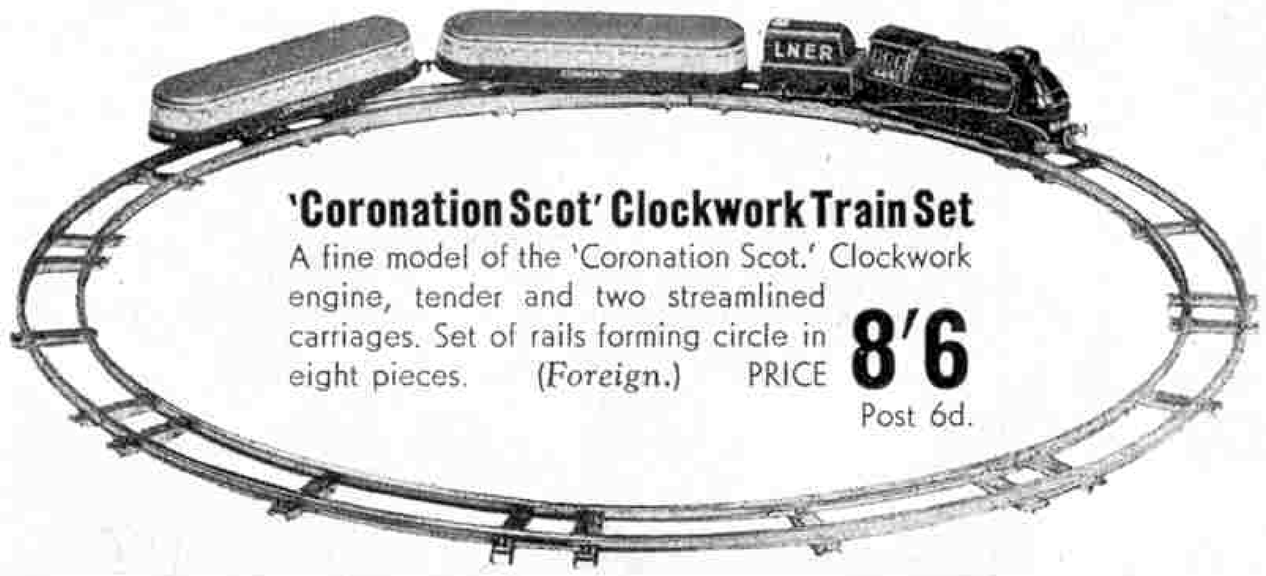
BY APPOINTMENT



NEW UNION JACK GAME
Balance twelve coloured sticks on back of hand, place hand flat on table. The object of the game is to shake the sticks off until an equal proportion of colours are out on the table. Set of 12 sticks, coloured each side, in box, making 8 red, 8 white and 8 blue. PRICE **2′-**
(*Foreign.*) Post 3d.

MECHANICAL CHANNEL SHIPPING
Steamboat journeys over the waves, rocking realistically and turning round automatically at the end of its course. Lighthouse flashes on and off while boat is in action. PRICE **3′6**
(*Foreign.*) Post 4d.

ERAC CAMERA GUN
Automatic Snapshot Camera. No winding. No view-finding. Makes exposure and winds film roll in one action. The only camera of its kind in the world. PRICE **12′6**
Post 4d.



'Coronation Scot' Clockwork Train Set
A fine model of the 'Coronation Scot.' Clockwork engine, tender and two streamlined carriages. Set of rails forming circle in eight pieces. (*Foreign.*) PRICE **8′6**
Post 6d.

Hamleys
Estd. 1760
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Telephone: REGENT 3161. OUR ONLY ADDRESS!

A genuine Kodak folding camera for 30/-

The SIX-20 FOLDING 'BROWNIE'

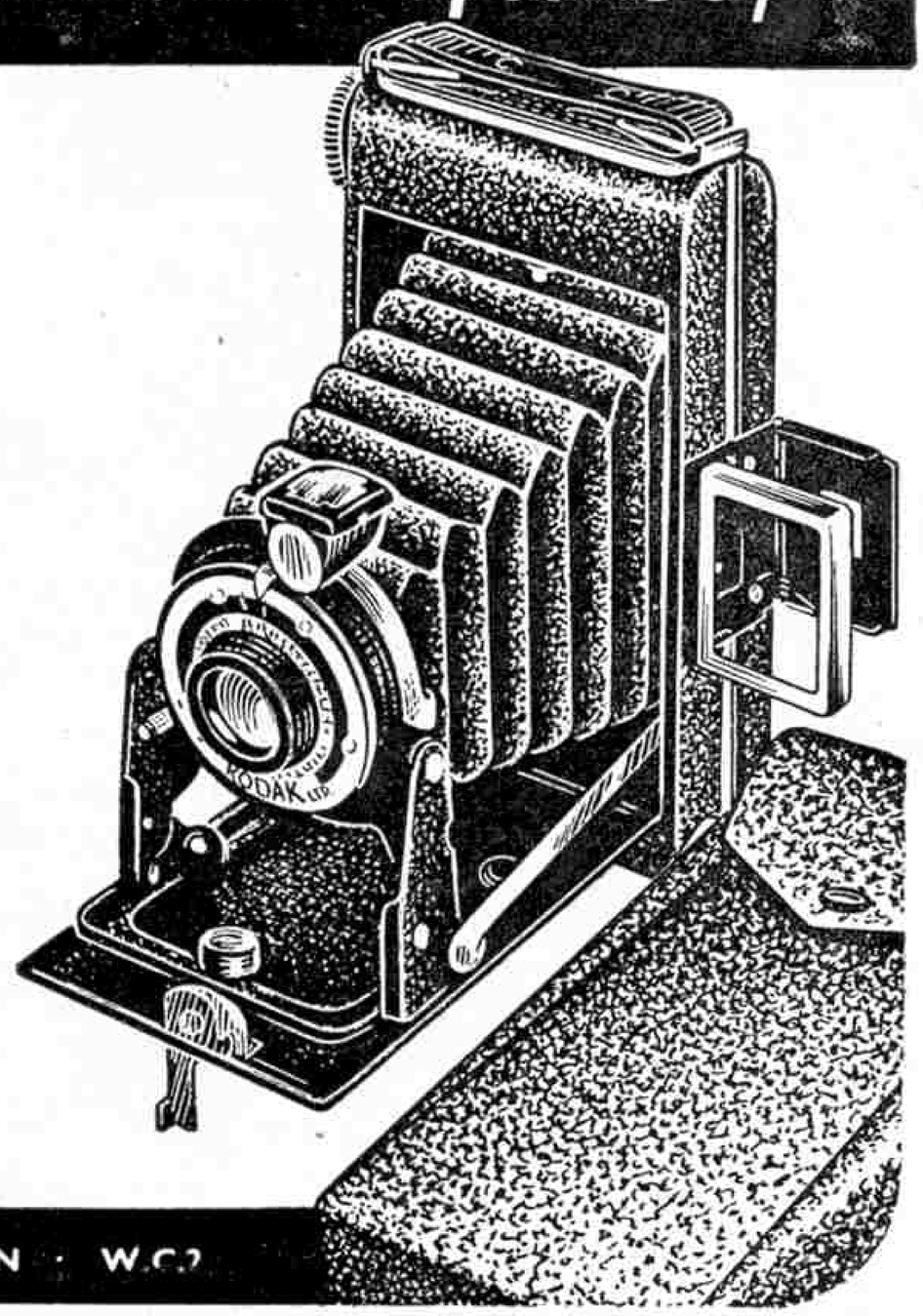
With this camera you get a real Kodak tested lens, a "Time" exposure adjustment, a direct-vision, eye-level finder and a two-way reflecting finder as well.

The camera opens in a flash, all ready for snaps, and closes as quickly, while the back is hinged and the spool holders swing up for easy loading.

It's a smart camera, made even smarter by the shoulder-strap Carrying Case included in the price, and it takes first-class, full-size pictures measuring 3¼ by 2¼ inches.

With two viewfinders - - - - - **30/-**
With eye-level finder only - - - - **27/6**

Ask your Kodak dealer to let you see it!



KODAK LTD. · KODAK HOUSE · KINGSWAY · LONDON · W.C.2

Are you 'Camera-Conscious'?

WHEN you want to snap somebody or something quickly—just at the right moment—can you do so without having to worry about this gadget or that, and thus finding you've lost that expression you so wanted to catch? If not, you are conscious always of the camera. Zeiss Ikon cameras are so designed, however, that no "fiddling" is necessary; they are constructed by practical photographers. From the Zeiss Ikon range of cameras (which cost as little as £1 or as much as £87) you obtain the widest selection of the latest designs, and with world-famous lenses. Ask any photographer what that means!

● **The NETTAR** *(illustrated above)*
is one of the most popular Zeiss Ikon cameras as it is small and convenient enough to carry with you always. It takes 16 pictures each 2¼ in. x 1¾ in. on an ordinary 1/- film, and costs from £3 7s. 6d. to £5 12s. 6d., according to lens and shutter.

"A thousand and one Subjects"
is the title of the 40 page art brochure full of interesting facts about Zeiss Ikon cameras. Ask your local dealer for a copy, or send the coupon below.

Cut out and post this coupon NOW! While you think of it.
To: ZEISS IKON LTD., 46, Maidstone House, Berners St., London W.1
would like your 40 pp. brochure.
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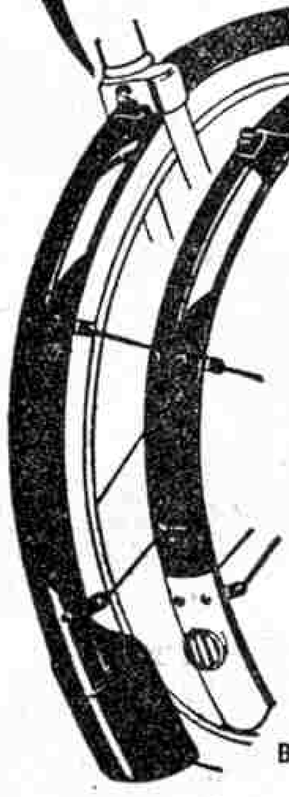
ADDRESS.....

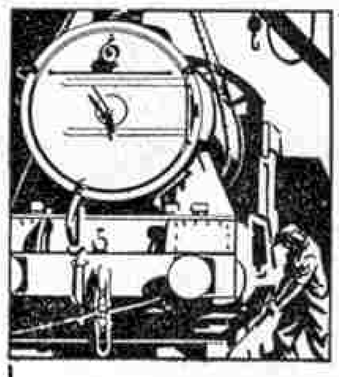
Bluemel's
FAMOUS for QUALITY



Bluemel's Celluloid Mudguards can be fitted to any cycle without interfering with the wheel adjustment. Quickly adjustable and detachable, with built-in mud flap on front guard. **Prices from 4'8 per pair, in Black.** Colours extra.

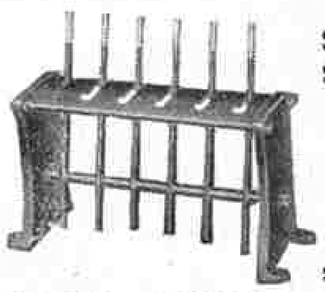
Write for Pocket Catalogue.

BLUEMEL BROS. LTD., Dept. 27, WOLSTON, Nr. COVENTRY



Just like the real thing!

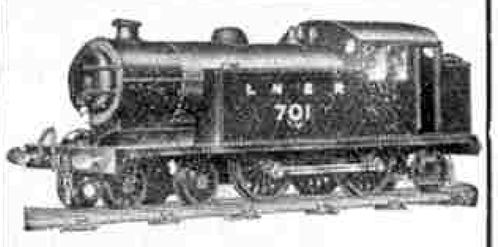
YOU want your model railway rolling stock, stations, and all accessories to be just like the real thing—that's exactly what you get with MILBRO models. MILBRO engineers work to limits as fine as .001 of an inch to make sure that you get the real thing—in miniature! You can always be sure that your MILBRO model railway equipment is correct in every detail, and will give you long, trouble-free service. Get the catalogue, it's only 6d.



6-LEVER FRAME 7/6

SIGNAL CABINS S/7, 9" long, 5/9

UPPER QUADRANT SIGNALS 2-arm bracket signal. Home or Distant 10/-

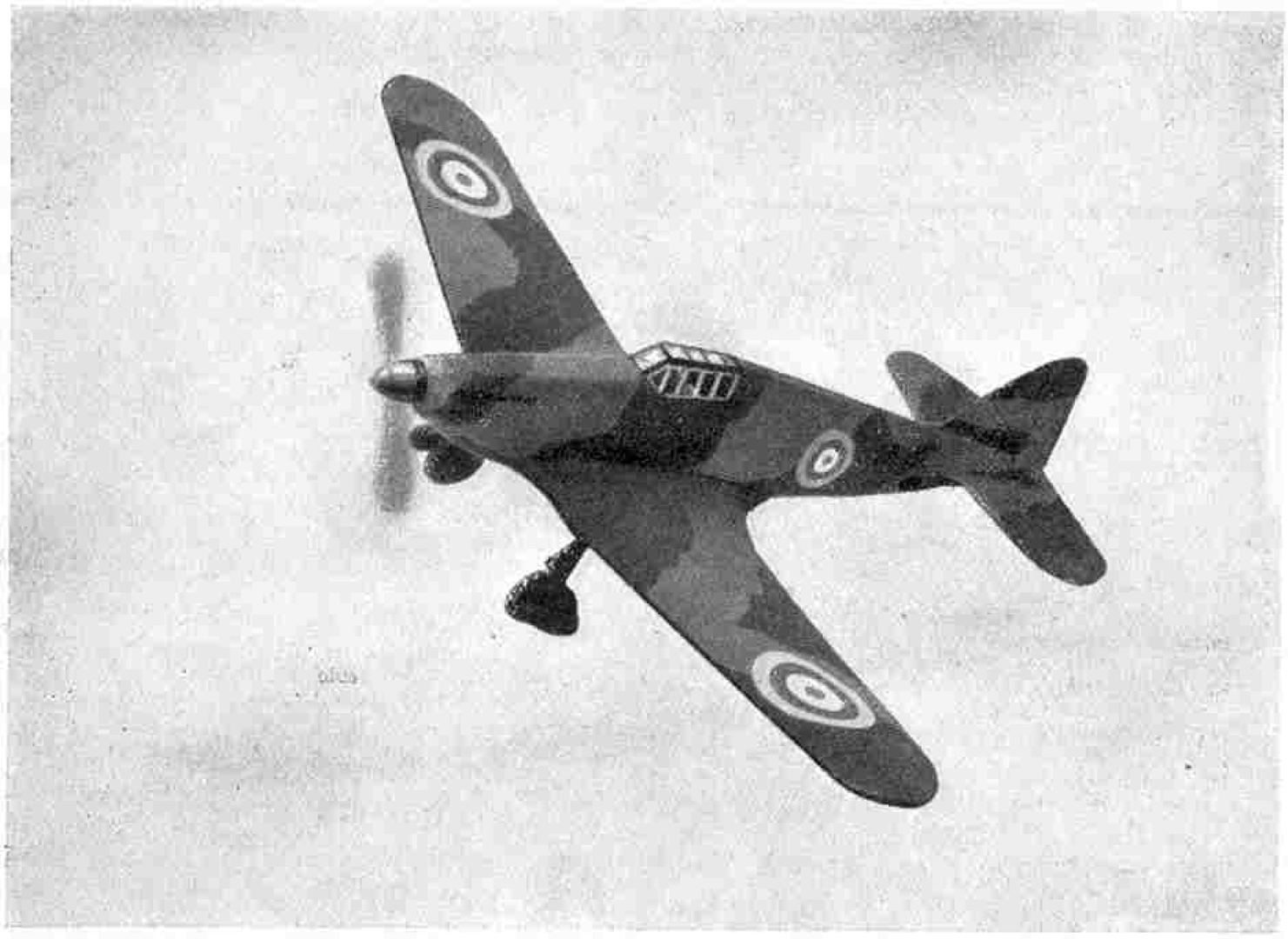


STANDARD TANK ELECTRIC LOCOMOTIVE £2.19.6

MILBRO *TRUE-TO-SCALE models for reliability*

MILLS BROS. (Model Engineers) LTD., St. Mary's Road, SHEFFIELD
London Showrooms:
2, Victoria Colonnade, Victoria House, Southampton Row, W.C.1

BUILD THESE FLYING MODELS FOR 1'6



The Hawker Hurricane (left) and Heston Phoenix (below) are two of the newest additions to the FROG range of constructional kits. The introduction of these kits in which all parts are cut to shape and the need for tools eliminated has done much to bring model aeroplane building within the reach of all!

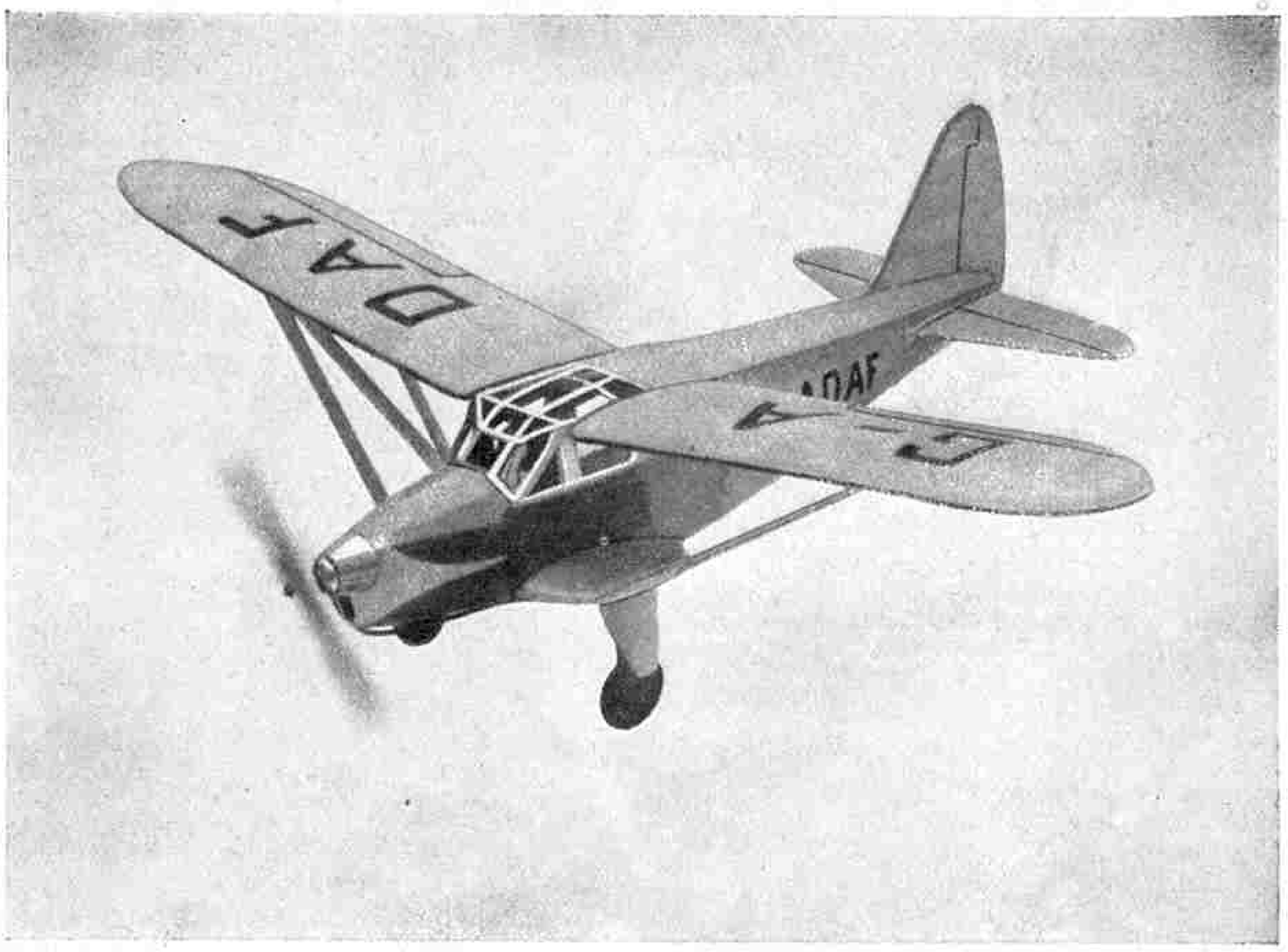
NO TOOLS REQUIRED · ALL PARTS CUT TO SHAPE · INSTRUCTIONS EASY TO FOLLOW · EXCELLENT PERFORMANCE

D.H. LEOPARD MOTH 2/6
D.H. HORNET MOTH 3/6
HAWKER DEMON 4/6
FAIREY III F. 5/6
MILES HAWK MAJOR 10/6
***COMPETITION MODEL 17/6**
***WAKEFIELD TROPHY MODEL 21/-**
***PTERODACTYL 21/-**

**Specially designed for use in S.M.A.E. competitions*

3 NEW LOW PRICED MODELS

HAWKER HURRICANE	**1'6**
HESTON PHOENIX	**1'6**
B. A. SWALLOW	**2'6**



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MODEL AIRCRAFT

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Made in England by International Model Aircraft Ltd.

OBTAINABLE AT ALL GOOD TOYSHOPS AND STORES Sole Concessionaires:

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COUPON *Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and how to obtain handsome enamelled "Frog" Pilot badges.*

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PLEASE WRITE IN BLOCK LETTERS 6138

PERFECT SCALE MODELS

DINKY TOYS

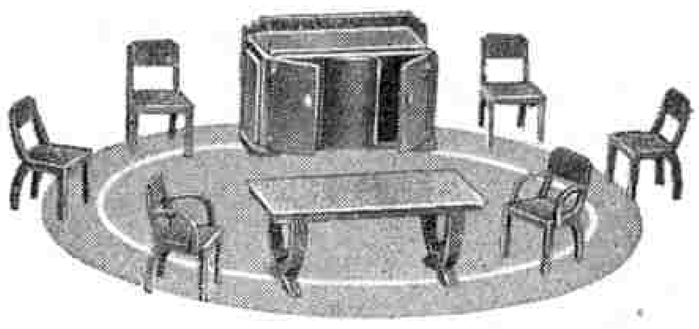
OVER 300 VARIETIES

Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes. This season many new items have been introduced including wonderful scale models of military Tanks and Aeroplanes, latest types of Motor Cars, complete with driver and passenger, and many others.

Every boy or girl who has not already done so should start this delightful collecting hobby to-day. All the models can be purchased either separately or in complete sets.

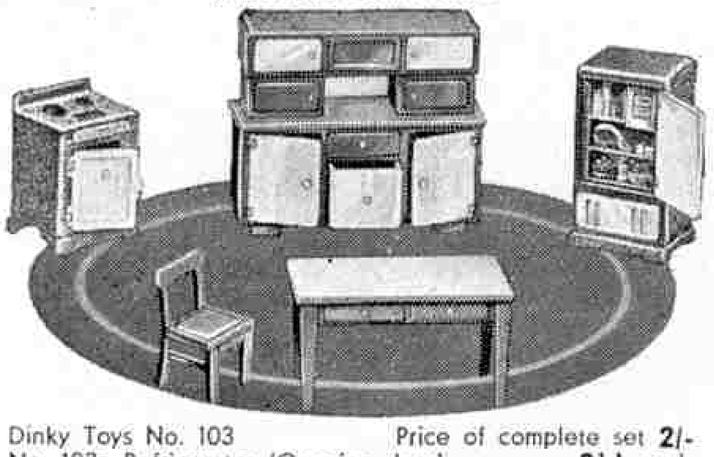
DOLL'S HOUSE FURNITURE. We draw special attention to the fact that we have found it possible to reduce the prices of these popular Dinky Toys.

DINING-ROOM FURNITURE



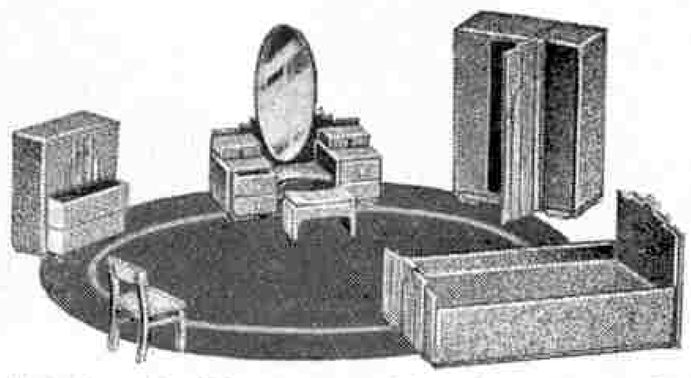
Dinky Toys No. 101 Price of complete set **1/9**
No. 101a Table ... ... **4d.** each
No. 101b Sideboard (Opening doors) ... ... **7d.** ,,
No. 101c Carver Chairs (2) ... ... **2½d.** ,,
No. 101d Chairs (4) ... ... **1½d.** ,,
Supplied in walnut brown finish only.

KITCHEN FURNITURE



Dinky Toys No. 103 Price of complete set **2/-**
No. 103a Refrigerator (Opening door) ... **6½d.** each
No. 103b Kitchen Cabinet (Opening doors and drawer) ... ... **8d.** ,,
No. 103c Electric Cooker (Opening door) ... **5d.** ,,
No. 103d Table ... ... **3½d.** ,,
No. 103e Chair ... ... **1½d.** ,,
Supplied in two colour schemes—light blue and white; light green and cream.

BEDROOM FURNITURE

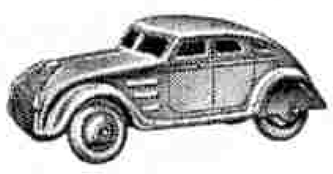


Dinky Toys No. 102 Price of complete set **2/3**
No. 102a Bed ... ... **5d.** each
No. 102b Wardrobe (Opening door) ... ... **7d.** ,,
No. 102c Dressing Table (Opening drawers)... **8d.** ,,
No. 102d Dressing Chest (Opening drawers)... **5d.** ,,
No. 102e Dressing Table Stool ... ... **1½d.** ,,
No. 102f Chair ... ... **1½d.** ,,
Supplied in colour or walnut brown finish.

MOTOR TRUCK

Dinky Toys No. 22c
Assorted colours. Fitted with detachable rubber tyres.
Price **6d.** each

STREAMLINE SALOON



Dinky Toys No. 22h
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each

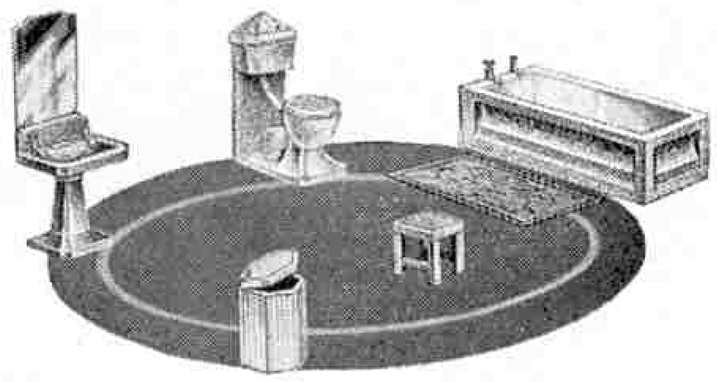
REFUELLING TENDER

Dinky Toys No. 60y
Realistic model of Thompson Bros. Tender used for refuelling aeroplanes at aerodromes.
Price **8d.** each

BEACON

Dinky Toys No. 47d
Realistic model of the Belisha Safety Beacon.
Price **1d.** each

BATHROOM FURNITURE



Dinky Toys No. 104 Price of complete set **1/6**
No. 104a Bath **4½d.** each No. 104b Bath Mat **½d.** each
No. 104c Pedestal Hand Basin ... ... **4½d.** ,,
No. 104d Stool ... ... **1½d.** ,,
No. 104e Linen Basket (Opening lid)... ... **3d.** ,,
No. 104f Toilet (Lifting lid) ... ... **4½d.** ,,
Supplied in two colour schemes—pink and white; light green and white.

DOUGLAS D.C.3 AIR LINER

Dinky Toys No. 60t
A scale model of a Douglas D.C.3 air liner, a type in regular service on American and European routes.
Price **9d.** each

AIRSPEED "ENVOY" MONOPLANE

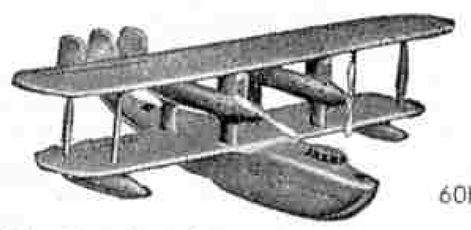
Dinky Toys No. 62m
Scale Model of the Airspeed "Envoy" twin-engined commercial monoplane. Assorted colours.
Price **6d.** each

THE KING'S AEROPLANE
Dinky Toys No. 62k
Scale model of the Airspeed "Envoy" supplied to the Air Council for the King's Flight.
Price **8d.** each

R.A.F. AEROPLANES

60N

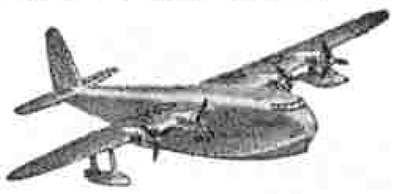
60P



60H

Dinky Toys No. 61
No. 60h "Singapore" Flying Boat ... ... each **1/-**
No. 60n Fairey "Battle" Bomber (2) ... ... ,, **4½d.**
No. 60p Gloster "Gladiator" Biplane (2) ... ... ,, **6d.**
Price of complete set **2/9**

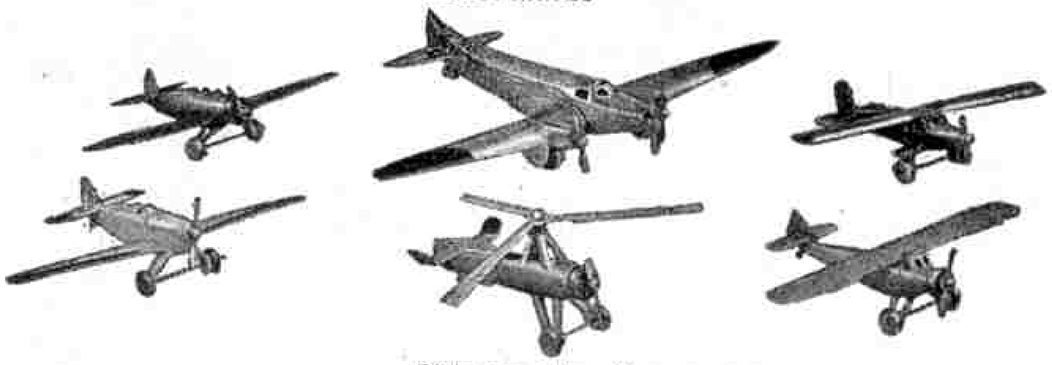
EMPIRE FLYING BOATS



Dinky Toys No. 60l
Scale models of the latest Imperial Airways Flying Boats. Twelve models available named: *"Caledonia," "Canopus," "Corsair," "Challenger," "Centurion," "Cambria," "Calpurnia," "Ceres," "Clio," "Calypso," "Corinna"* and *"Cheviot."* Price **1/-** each

ATLANTIC FLYING BOAT
Dinky Toys No. 60x
Similar in type to the Empire Flying Boat. Assorted colours.
Price **1/-** each

AEROPLANES



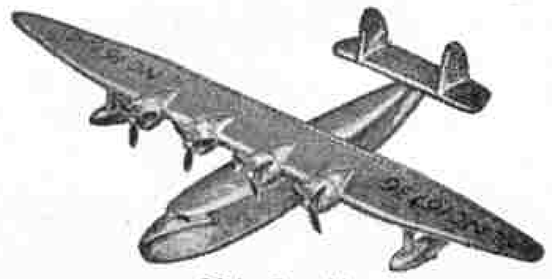
Dinky Toys No. 60z
The set consists of six models of famous French aeroplanes—"Arc-en-Ciel," Potez 58, Hanriot H180T, Breguet-Corsaire low wing monoplane, Dewoitine 500 and Cierva Autogiro. (Made in the Meccano Factory in Paris.)
Price **3/-**

MONOPLANE "ARC-EN-CIEL." Dinky Toys No. 60az
A Scale model of the famous French triple-engined monoplane "Arc-en-Ciel." (Made in the Meccano Factory in Paris.)
Price **9d.** each

ARMSTRONG WHITWORTH "WHITLEY" BOMBER

Dinky Toys No. 60v
Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F.
Price **9d.** each

FLYING BOAT "CLIPPER III"



Dinky Toys No. 60w
Scale model of the Pan American Airways flying boat that took part in the transatlantic experimental flights in 1937.
Price **1/-** each

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

A FASCINATING COLLECTING HOBBY DINKY TOYS FINISHED IN RICH COLOURS

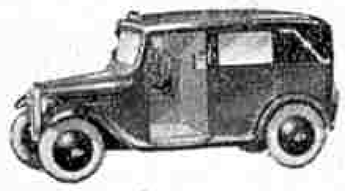
"THUNDERBOLT" SPEED CAR

Dinky Toys No. 23m
A fine scale model of the car in which Capt. G. E. T. Eyston set up a world land speed record of 312 m.p.h. at Bonneville, Utah, U.S.A., in 1937. Price **1/-** each

SIX WHEELED WAGON

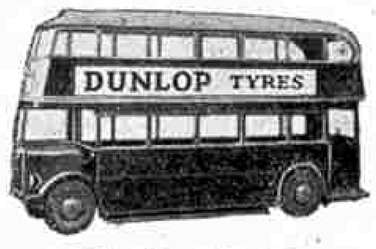
Dinky Toys No. 25s
An interesting model of a modern three-ton wagon. In assorted colours.
Price **1/-** each

TAXI WITH DRIVER



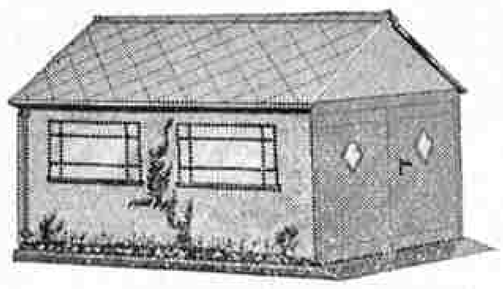
Dinky Toys No. 36g
Fitted with detachable rubber tyres.
Price **11d.** each

DOUBLE DECKER BUS



Dinky Toys No. 29c
Assorted colours. Fitted with detachable rubber tyres.
Price **1/-** each

GARAGE



Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars.
Price **1/3** each

POLICE MOTOR CYCLIST
Dinky Toys No. 37b

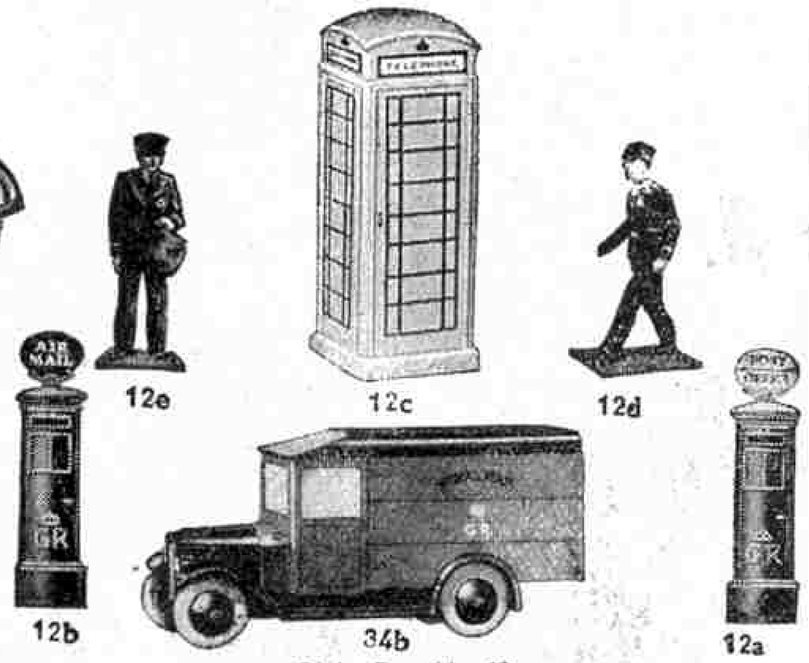
Price **6d.** each

CIVILIAN MOTOR CYCLIST
Dinky Toys No. 37a

Assorted colours. Price **6d.** each

Royal Corps of Signals Despatch Rider. Dinky Toys No. 37c
Similar to Dinky Toys No. 37b. Finished in correct colours. Rubber tyres.
Price **6d.** each

POSTAL SET



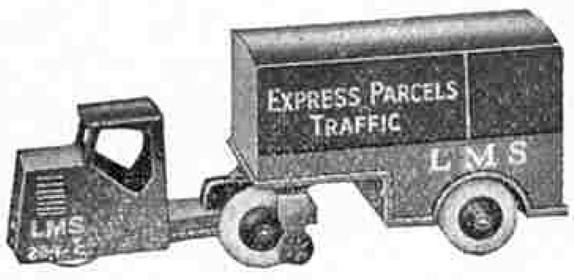
12b 12e 12c 12d 34b 12a

Dinky Toys No. 12

No. 12a	Pillar Box, G.P.O.	each **3d.**
No. 12b	„ „ Air Mail	„ **3d.**
No. 12c	Telephone Call Box	„ **4d.**
No. 12d	Telegraph Messenger	„ **3d.**
No. 12e	Postman	„ **3d.**
No. 34b	Royal Mail Van	„ **10d.**

Price of complete set **2/3**

RAILWAY MECHANICAL HORSE AND TRAILER VAN

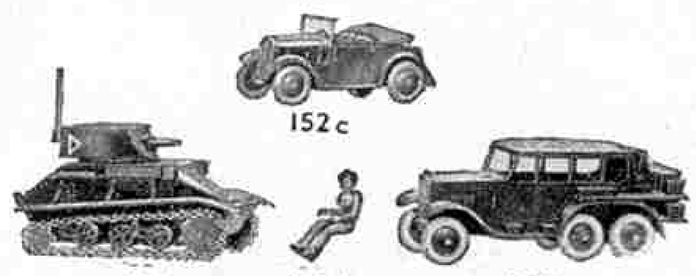


Dinky Toys No. 33R
Fitted with detachable rubber tyres.

No. 33Ra	Railway Mechanical Horse	each **8d.**
No. 33Rd	Trailer Van	„ **10d.**

Price, complete, L.M.S.R., L.N.E.R., G.W.R. or S.R. ... **1/6**

ROYAL TANK CORPS LIGHT TANK SET



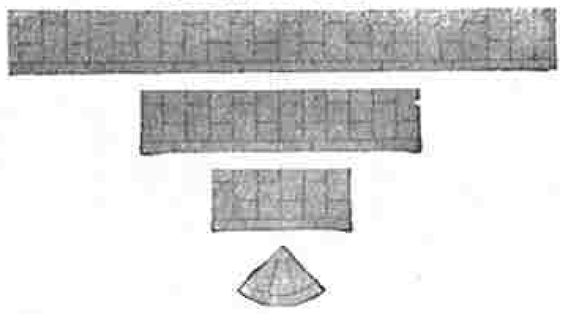
152c 152a 150d 152b

Dinky Toys No. 152

No. 152a	Light Tank (4½ tons, 25 h.p.)	each **1/2**
No. 152b	Reconnaissance Car ...	„ **1/–**
No. 152c	Austin Seven Car ...	„ **4d.**
No. 150d	Driver	„ **3d.**

Price of complete set **2/9**

PAVEMENT SET



Dinky Toys No. 46
The contents of this set are four 3 in., six 6 in. and four 12 in. strips of pavement and four quarter discs for corners.
Price of complete set **6d.**

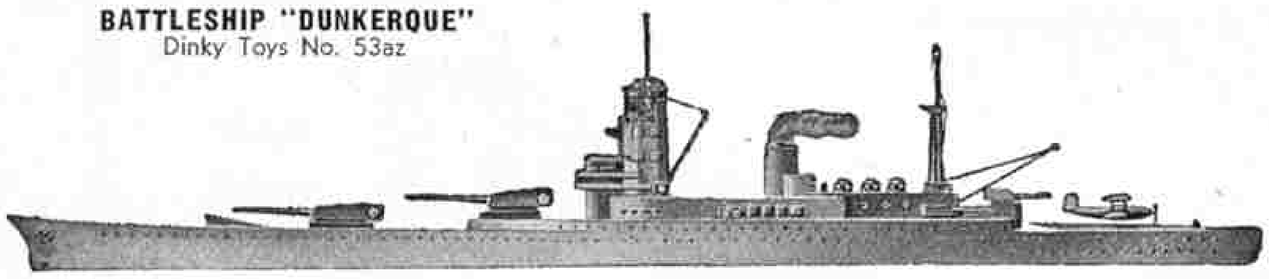
SMALL CARS

Dinky Toys No. 35 Fitted with rubber tyres.
No. 35a Saloon Car each **3d.** No. 35b Racer each **3d.**
No. 35c "M.G." Sports Car ... ... „ **3d**
Price of complete set **9d.**

AUSTIN SEVEN CAR
Dinky Toys No. 35d

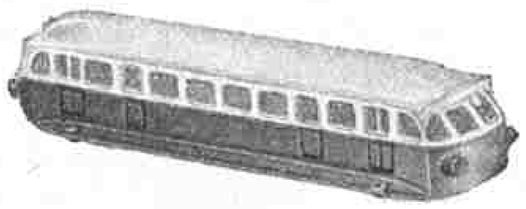
This model is the same as No. 152c, illustrated above, except that it is finished in a range of different colours. Price **4d.** each.

BATTLESHIP "DUNKERQUE"
Dinky Toys No. 53az



Scale model of the French 26,500 ton Battleship "*Dunkerque*," which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
(Made in the Meccano Factory in Paris.)

DIESEL RAIL CAR



Dinky Toys No. 26z
A realistic model of a modern Diesel-engined rail car. Price **5d.** each.
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THREE-WHEELED DELIVERY VAN

Dinky Toys No. 14z
Fitted with opening lid.
Price **10d.** each
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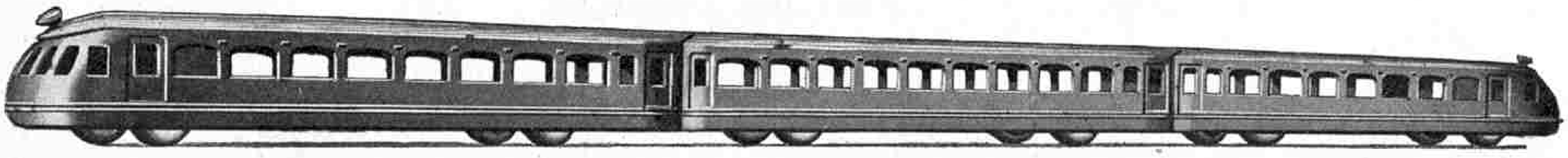
STREAMLINE DIESEL ARTICULATED TRAIN



Dinky Toys No. 16z Price **1/6** each (Made in the Meccano Factory in Paris.)

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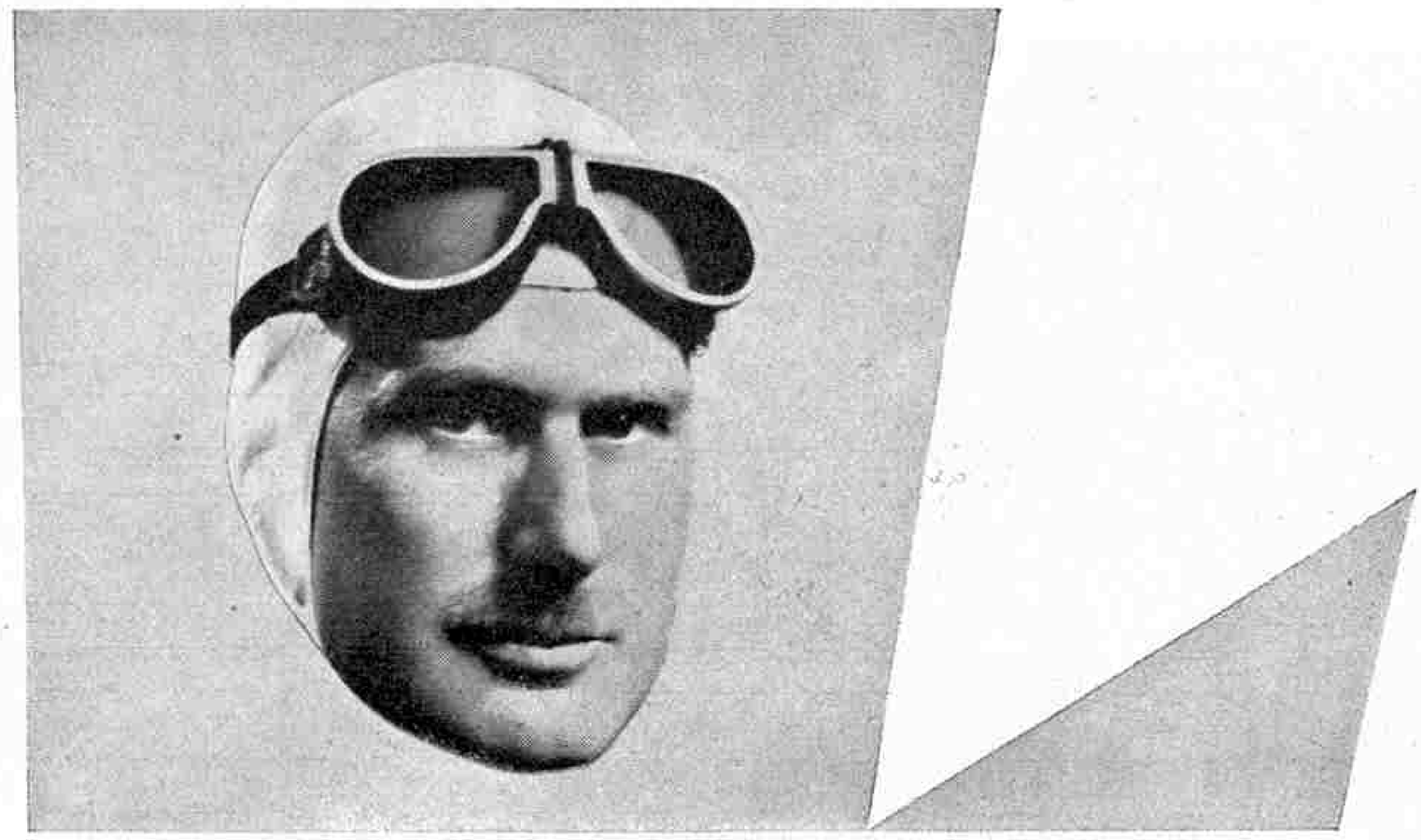

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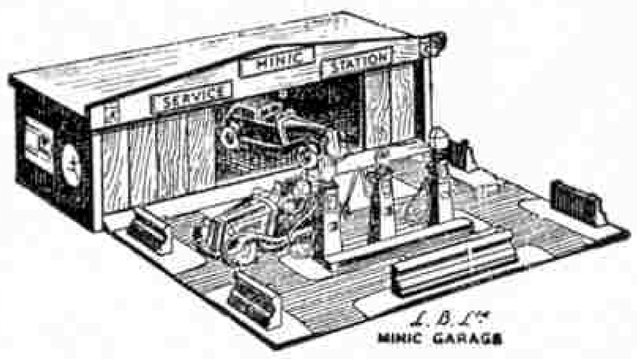
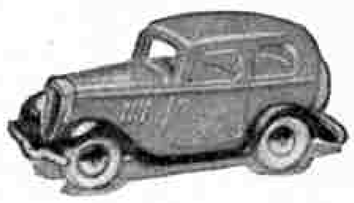


B MINIC Garage
Realistic new design, fitted with sliding doors and electric light. Equipment includes three large petrol pumps and one large oil cabinet. Light oak finish with folding base.
LENGTH 12 ins. Price **4/11**
CARS NOT INCLUDED.



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With Electric Light and Battery **3/6**
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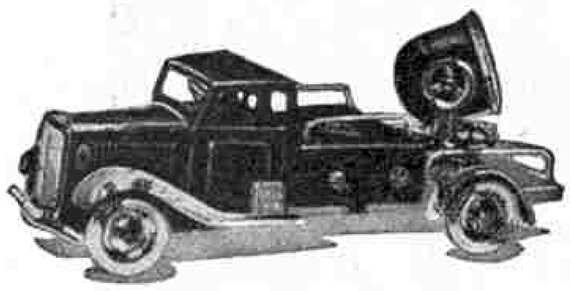

MINIC Searchlight Lorry
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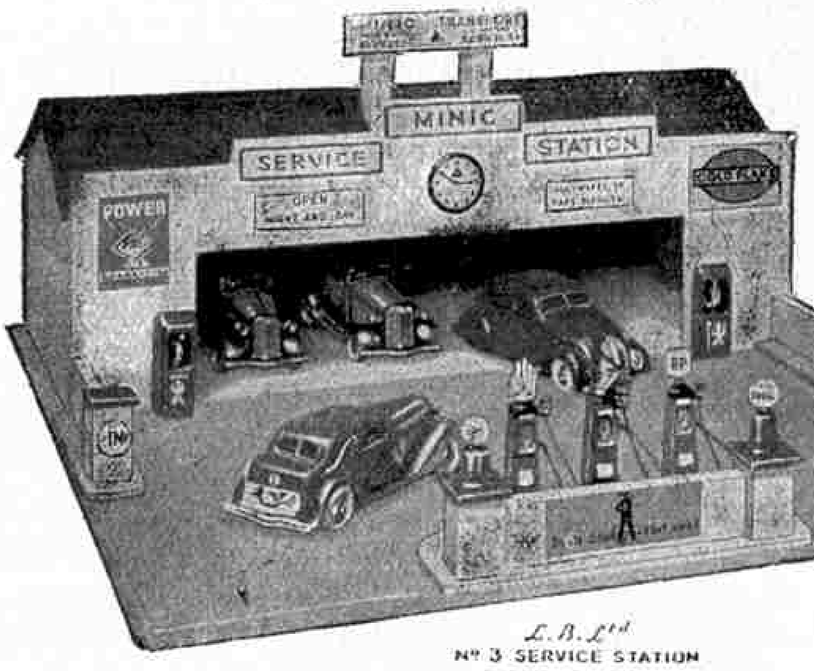
LENGTH 5½ ins. Price **3/6**



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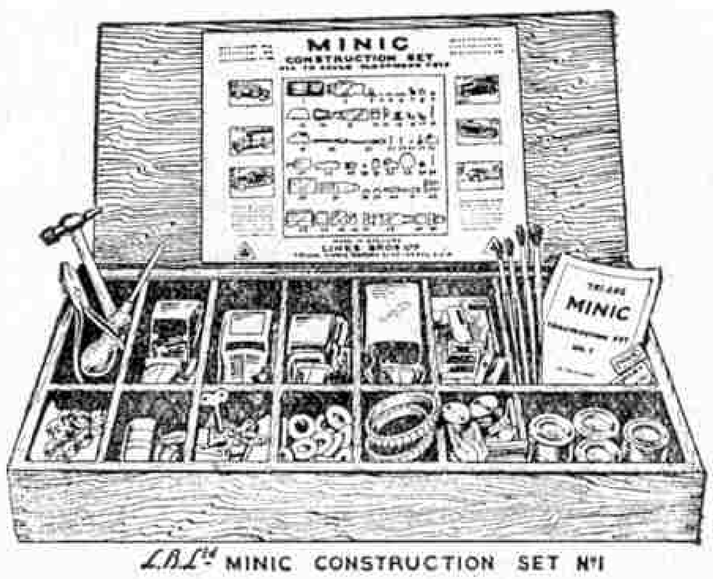
OTHER MODELS from **1/-** to **32/6**



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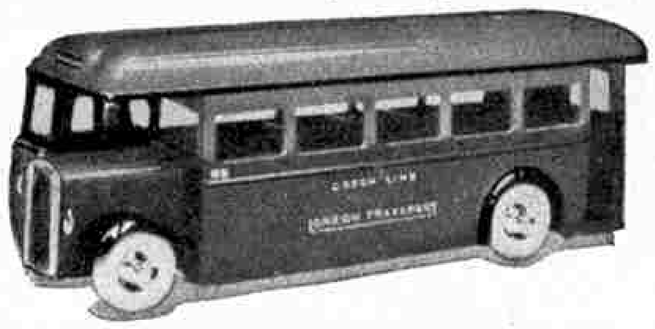
A complete set of parts for making six types of MINIC all to scale clockwork models. All parts, including powerful clockwork motor units, are made with precision tools and machines. Full instructions and tools are included in each set which is packed in a handsome oak finished cabinet 18 ins. x 9¾ ins. x 2½ ins. Price **15/-**



MINIC Single Deck Bus
LENGTH 7¼ ins. Price **3/6**

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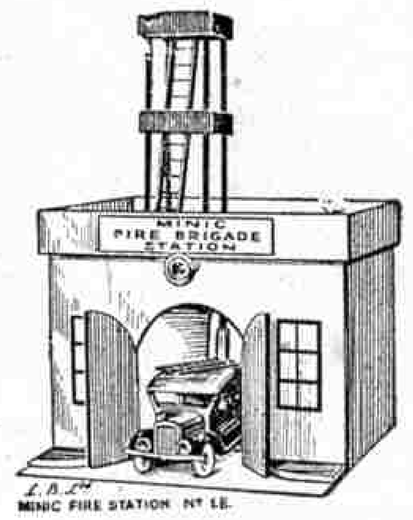

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Fitted with novel mechanical device which releases Fire Engine, automatically lights warning signal and rings alarm. Supplied complete with battery.
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Can also be obtained without warning signal, etc. Price **5/11**
FIRE ENGINE NOT INCLUDED IN EITHER MODEL.

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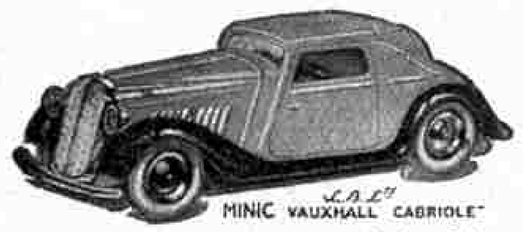
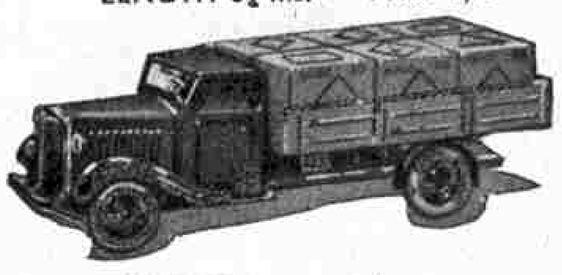


LENGTH 5 ins. Price **1/-**

MINIC Daimler Sunshine Saloon
with Electric Headlamps and Battery.
LENGTH 5¼ ins. Price **3/6**



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MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
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Vol. XXIII. No. 6
June 1938

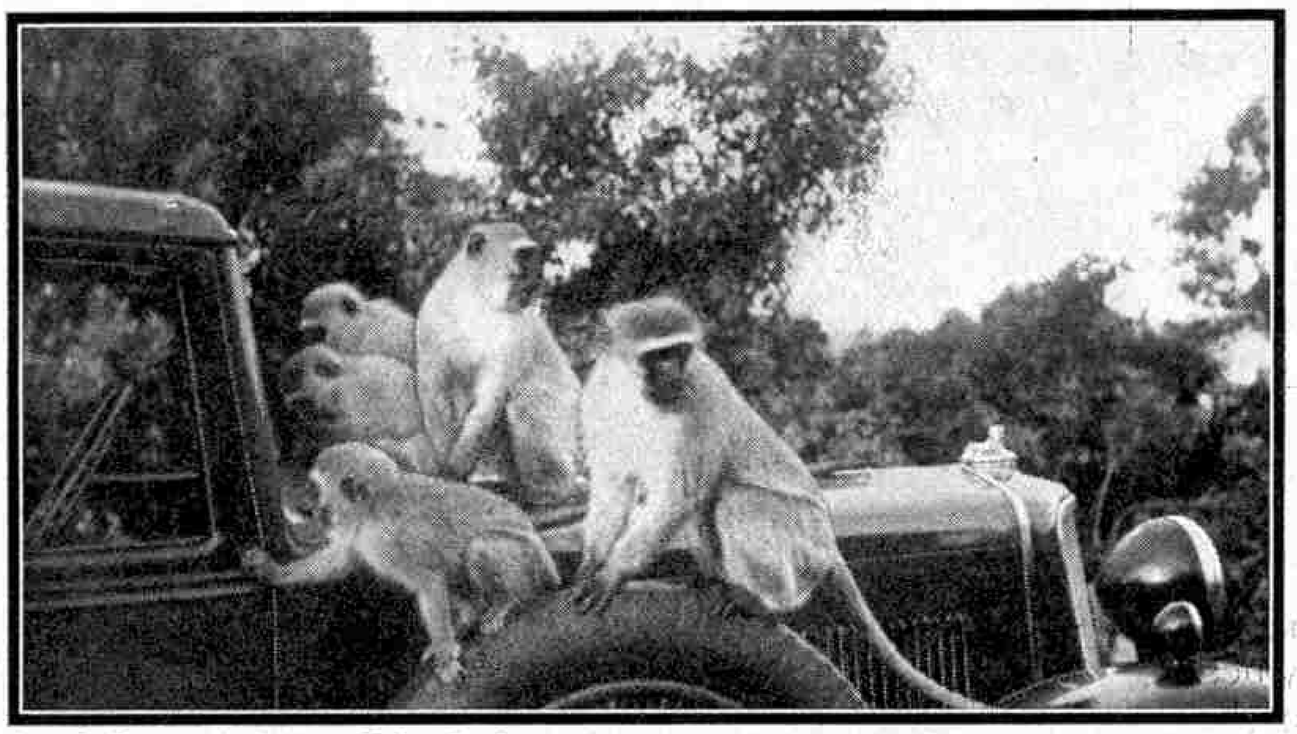
With the Editor

A Priceless Imagination!

A recent issue of the "*Great Western Railway Magazine*" contained an extract from a letter said to have been written by a small boy on his first visit to London to impress his younger brother, who remained at home in Bridgnorth, with the marvels of the great city. This enthusiast excels himself in his description of Paddington Station, which seems to be more wonderful than anything that I had previously imagined! He writes:

"The sight of Paddington Station is really beyond description. The roof is practically invisible being 2,500 feet above the platforms, aeroplanes circling beneath it all day. The roof is made of glass and requires 5,000 men to clean it once weekly in an airship.

"There are so many platforms that it is totally impossible to count them—the length of them is quite five miles. There are motor buses to take passengers from one end of a platform to the other; each bus holds 3,000 people.



A typical scene on Burman Drive, Durban, where there are thousands of monkeys in the thick bush. Many motorists stop to watch the monkeys, which board the cars to beg for food and cause great amusement by their antics. Photograph by J. Cowen, Durban.

"The trains are colossal; each train consists of 4,000 coaches and requires 20 engines to pull it. The trains are of the corridor type and are equipped with motor cycles to convey passengers to lavatories and dining saloons.

"Each engine is 50,000 h.p. and requires 50 men to stoke it. It is necessary to have motor-lorries in each cabin to convey the coal from tender to fire-box.

"There is a refreshment room at Paddington Station which is seven times the length of Bridgnorth High Street and four times as wide.

"The Stationmaster is as big as St. Leonard's Church, Bridgnorth, the biggest man in the world. One cannot fail to hear him coming, as his boots are as big as the North Gate. He walks over the trains without any difficulty whatsoever."

Clearly I must revisit Paddington in the near future and examine the roof and platforms very carefully. Somehow I seem to have missed a good deal! Afterwards I think I will seek out the Stationmaster; I should dearly like to know what he thinks of it all!

The Short-Mayo Composite

Since the article on the Short-Mayo Composite aircraft that appears on page 320 of this issue was written, the machine has successfully carried out full-load tests at the Air Ministry Marine Aircraft Establishment, Felixstowe. During these trials the flying boat "*Maia*" that forms the lower component of the aircraft carried a crew of three in addition to the pilot, and the seaplane "*Mercury*" that is borne on its back had a crew of two. In the earlier tests at Rochester, referred to in the article, each component had only a pilot on board. The full-load tests involved "*Mercury*" carrying sufficient petrol for a long-distance flight, and as only the separation of the two components was demonstrated, a large amount of fuel was jettisoned soon after the seaplane had been launched from the flying boat, so that "*Mercury*" could land safely on the water.

The Short-Mayo Composite has returned to its builders at Rochester for new engines to be fitted to "*Mercury*." This work is expected to be completed this month, and the aircraft will then be ready to undertake a series of long-distance demonstration flights, which will include the launching of "*Mercury*" for flights round Great Britain and across the Atlantic.

Next Month

One of the most interesting forthcoming events will be the Jubilee of the granting of the first patent for the pneumatic tyre to J. B. Dunlop, and in next month's "*M.M.*" I hope to tell the story of this invention and its wonderful development. In the same issue there also will be an account of the romantic career of the "*Cutty Sark*," the famous tea clipper, which after many adventures is to end her days as a training ship on the Thames. Other splendid illustrated articles will deal with the laying of new submarine cables between Great Britain and Ireland and Great Britain and Holland, and with the sailing barges that are such a picturesque feature in the Thames and Medway Rivers and certain east coast ports.

New Lift Bridges in Egypt

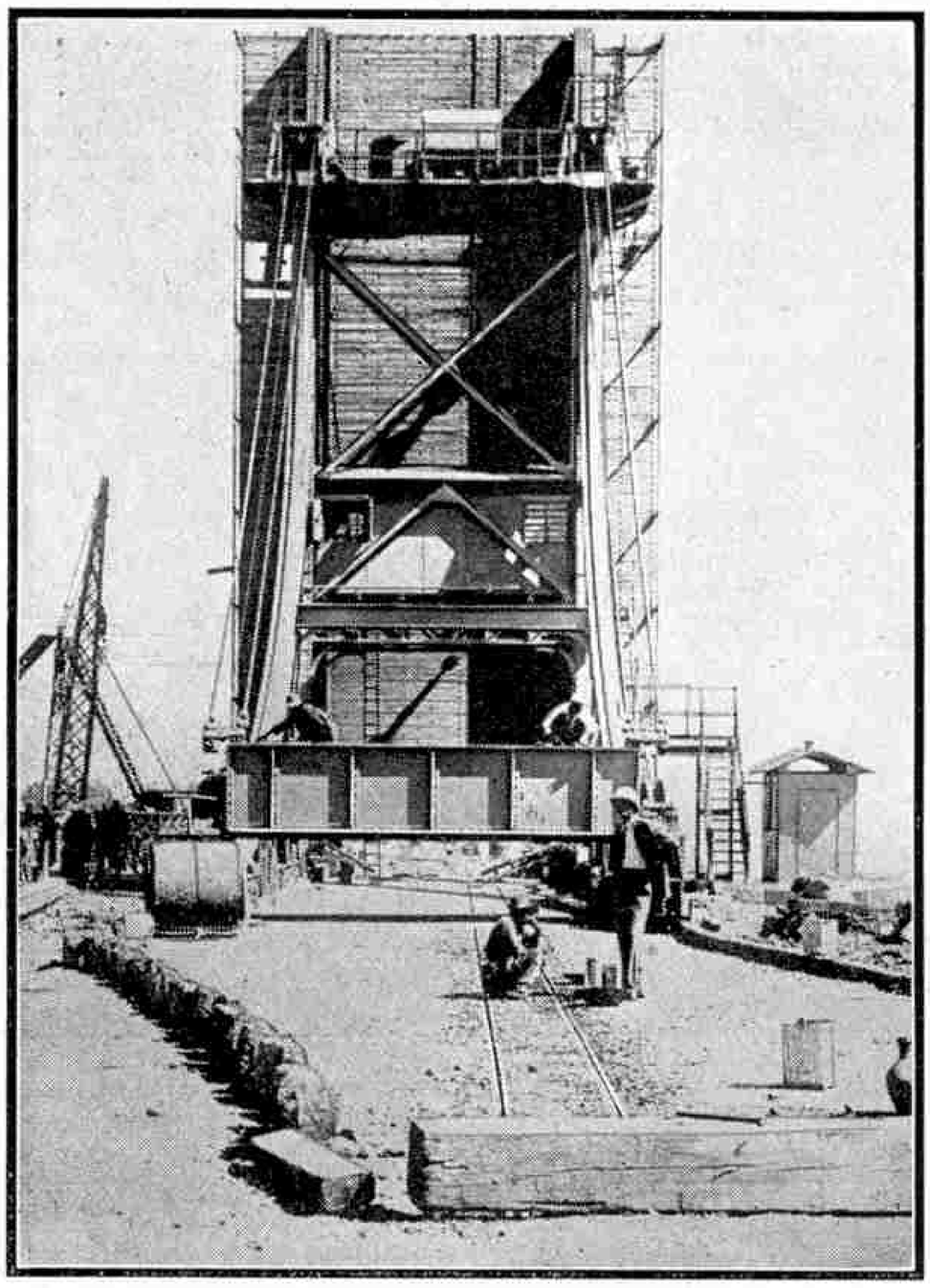
Reconstruction Work on a Nile Barrage

DURING the last three years extensive alterations and reconstruction work have been carried out at the great Assiut Barrage, which stretches across the Nile about 236 miles from Cairo. The purpose of the Barrage is to hold up the water released from the great Dam at Aswan, more than 300 miles farther upstream, so that it can be directed into irrigation canals that are cut through the surrounding country. It was built about 37 years ago and has a length of 2,750 ft. Its piers rest on a masonry apron laid on the bed of the river. Originally it had 111 double gates, but one of the arches has been filled in during remodelling, and when the new work is completed there will be 110 double sluice gates, each 16 ft. 4 ins. in width. The combined height of each pair of gates is 23 ft., and they are arranged so that the water stored upstream of the structure can be discharged either under the lower gate, or between the upper and lower gates.

The Barrage is crossed by a roadway, carried on arches supported by the piers, and in the original structure a swing bridge carried the highway across the lock by means of which vessels passed through the Barrage on their way up or down the Nile. In the course of the reconstruction work that has recently been undertaken, the old bridge has been replaced by the hinged lift bridge shown on our cover, which is a view along the completed roadway, over the lowered bridge, and in the first two of the illustrations to this article.

The new bridge is wide enough for two lines of traffic, with footpaths for pedestrians, and is of sufficient strength to allow the passage of vehicles up to 20 tons in weight. It consists of a steel tower on which is hinged the opening span, which is balanced by a heavy counterweight that travels down a curved track when the lifting span is raised and moves upward along its track as the span is lowered. Electrical machinery is employed to raise and lower the bridge.

The opening span is about 60 ft. in length from the hinge to its outer end, and the lock it crosses is 52 ft. 6 in. wide. There are two main plate girders, connected by a series of stout cross girders supporting a roadway 17 ft. 6 in. wide. The footpaths for pedestrians are outside the main girders, and supported from them by cantilever brackets, and both the roadway and the footpaths are decked with timber.



The new lift bridge across the lock of the Assiut Barrage after completion, with the span fully raised. We are indebted to Messrs. Coode, Wilson, Mitchell and Vaughan-Lee, consulting engineers, for the information in this article and our illustrations.

At the inner end of each of the main girders are iron castings, bolted to the plates, which support the steel shafts forming the hinge pins of the lifting span. The shafts are 6 in. in diameter, and are supported by two massive brackets made from steel plates and sections, one on each side of each girder. At the outer ends of the main girders are steel brackets to which are attached the wire ropes that connect the lifting span to the counterweight.

The tower rests on steel plates bedded down on to the masonry of the lock walls about 2 ft. below road level, and the space above the plates is filled in solid with concrete. The base plates nearest the lock support also the brackets that carry the hinges of the lifting span, to which reference has already been made.

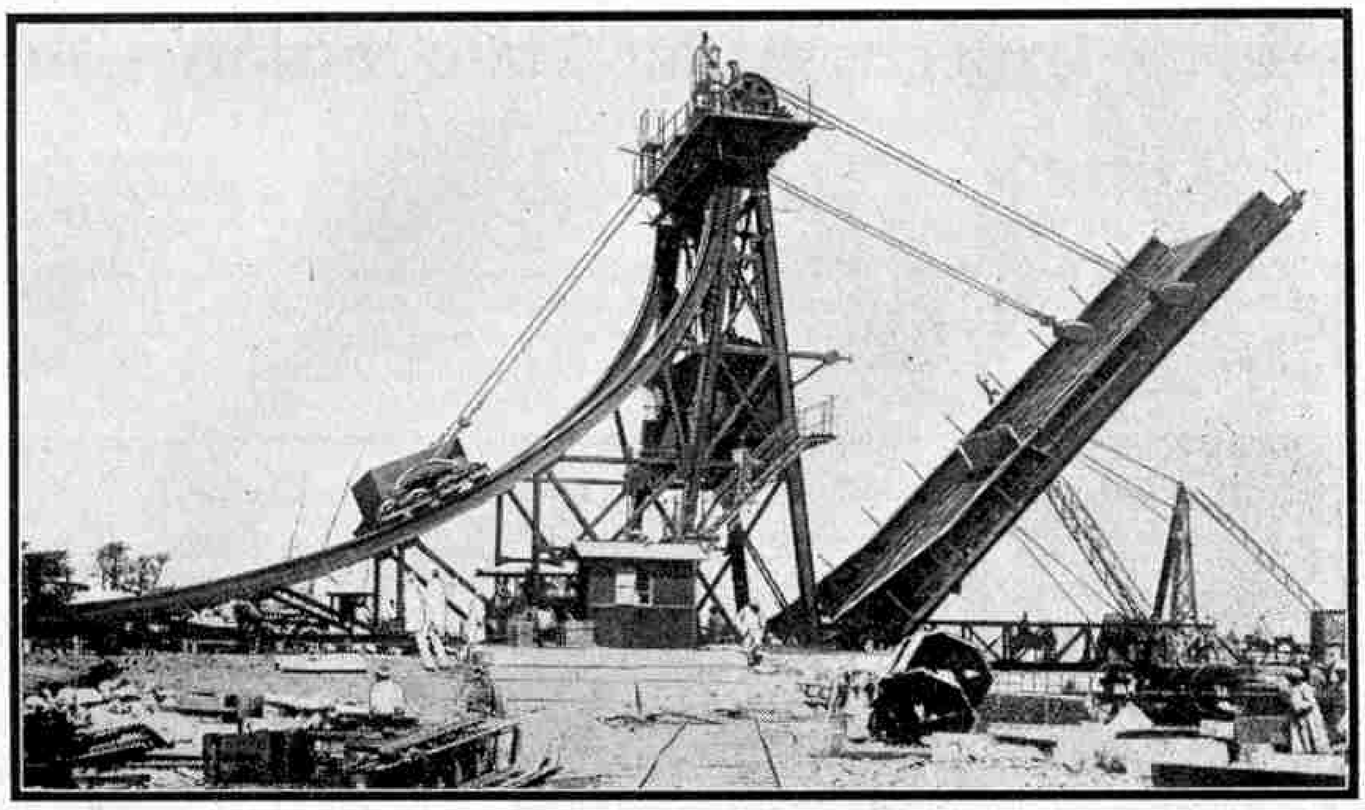
One of the most interesting features of the bridge is the elaborate arrangement provided for counterbalancing the weight of the span. The actual counterweight consists of a box built up of steel plates and sections, and divided into compartments by steel girders. It is loaded with cast iron blocks and pig iron, each layer of blocks being filled in solid with concrete, and four small pockets were left in the box in case it was found necessary to add more weight when the balance was tested after erection in Egypt. The total weight of the box and ballast is about 65 tons.

The box is swung on hinges between the centres of two cast steel arms, one of which can be seen in front of the box in the upper illustration on the next page, and each end of the cast steel arms is carried by a two-wheel bogie running on the track curving down from the top of the tower to the ground. The counterweight and the span are coupled to one another by means of four wire ropes, each 2 in. across, which pass over large pulleys 4 ft. 6 in. in diameter at the top of the tower.

The track is curved in the manner shown in the illustrations to allow the counterweight and the opening span to balance each other exactly in all positions. The familiar action of opening a hinged trap door illustrates the principle on which the arrangement is based, for less and less effort is required as the door is lifted, until finally when the door is vertical the whole of its weight is taken by the hinges. Similarly with the bridge. As the lifting span rises, more and more of the weight is taken by the hinges and less and less by the wire ropes, and the decrease

in the pull on these is allowed for by decreasing the slope of the rails on which the counterweight runs.

When the span is fully raised the counterweight is in its lowest position, that is, on the part of the track where it is almost horizontal. Most of the weight of the counterbalance is then carried by the rails, and only the small amount required to balance the span in its open position is taken by the wire ropes. At the other end of the curved track the slope is almost vertical. When the counterweight is travelling up or down this portion, and the lift-span is almost closed, or has just begun to rise, very little of the weight is taken by the track, leaving the greater portion to be carried by the wire ropes, thus providing the greater pull necessary to balance the span in this position.



Operating the span of the Assiut Barrage lift bridge just before it was completed by finishing the masonry around the abutment and putting the handrailing in place.

The span never quite reaches the vertical position, as it is necessary to be certain that the bridge will always close from the fully raised position.

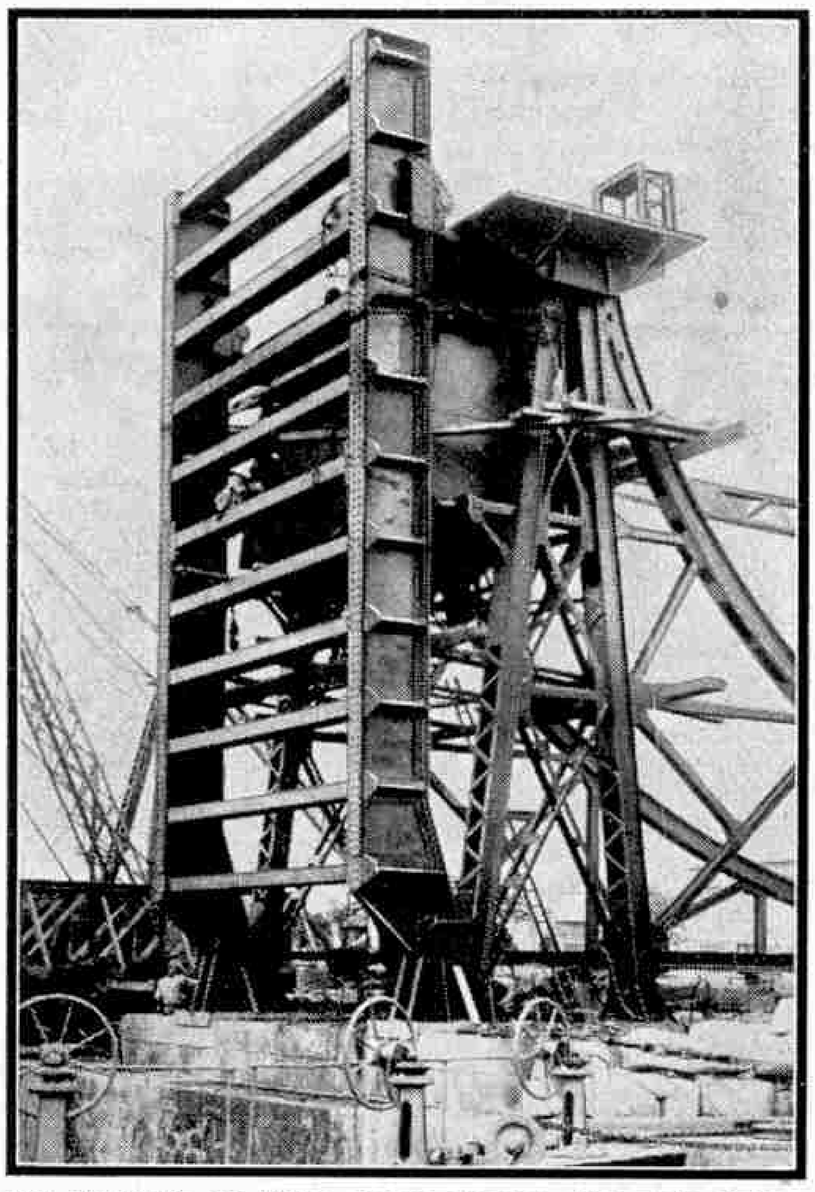
It will be realised that no portion of the weight of either the counterweight or the span is taken by the operating machinery, which has to deal only with resistance caused by friction and wind. This system of counterbalancing the span, therefore, effects a considerable saving in the amount of power required to operate the bridge.

In order to avoid difficulties in operation and maintenance the electrical machinery by which the span is raised and lowered is as simple as possible. The main driving unit is an electric motor, and the motor drive is transmitted through hydraulic variable speed gear. This gear not only allows the motor to be started practically free from load, but also allows the rate of movement of the bridge to be varied from the slowest creep to full speed. A further advantage of the use of this type of drive is that the hydraulic gear slips when the bridge is brought to a stop at the end of its travel, and so there is no possibility of damaging the motor.

The electric motor is of 25 h.p., and this power gives ample margin for dealing with additional loads due to wind pressure on the span. The motor and the part of the variable speed gear that is coupled to it are placed in a machinery cabin mounted on the lower part of the tower, about 20 ft. above the roadway. This primary section of the variable speed gear transmits power by pumping oil to the secondary part. This is situated on a platform at the top of the tower, and through mechanical gearing and shafting it drives the two wire rope barrels for the operating ropes, which are situated between each pair of large wheels carrying the balancing ropes attached to the counterweight and the span.

The bridge can be raised or lowered in about 1½ min. The movements are controlled from a small cabin by the side of the bridge at ground level. From this position the operator has a full view of the lock, and within easy reach is the motor control switch and a hand wheel by which the hydraulic variable speed gear is controlled. The instruments and gauges for the electrical and hydraulic gear are also mounted in this cabin, and just outside it is a stairway that leads to the machinery cabin on the tower. There also is a vertical ladder from this machinery cabin to the top platform.

There would be no difficulty in raising and lowering the bridge even if the electric supply failed, for auxiliary machinery mounted in the cabin on the tower would then be brought into use. It consists of a hand winch assisted by a small petrol engine of about 3 h.p. The winch is operated by four men, and the petrol engine is geared to it through a gear-box and chain drive. A hydraulic coupling of a type now used in many motor cars is fitted in order to ensure that the engine will slip if it is overloaded, and therefore will not contribute more than its share of power to the winch. A shaft from the hand winch is taken to the top platform and is there geared to the final drive from the main machinery. In normal conditions two men at the winch handles, assisted by the petrol engine, can raise or lower the bridge in about 6 min.



The Ibrahimia lift bridge during erection. The main girders and cross girders have been erected, and the former have been lashed to the tower steelwork by wire ropes.

There was included in the remodelling work at Assiut Barrage certain work on the head regulator of the Ibrahimia Canal, which leaves the Nile about a quarter of a mile upstream from the Barrage. This work included the provision of the new bridge shown in the lower illustration on this page. The bridge is of the same type as that across the lock of the Barrage, but its opening span is only 36 ft. between bearings.

The illustration shows erection work at an interesting stage. It will be seen that the main girders have been erected vertically on their hinge pins and the cross girders carrying the roadway are in position. The counterweight is not yet assembled on its track. The spans of both bridges were erected in this manner.

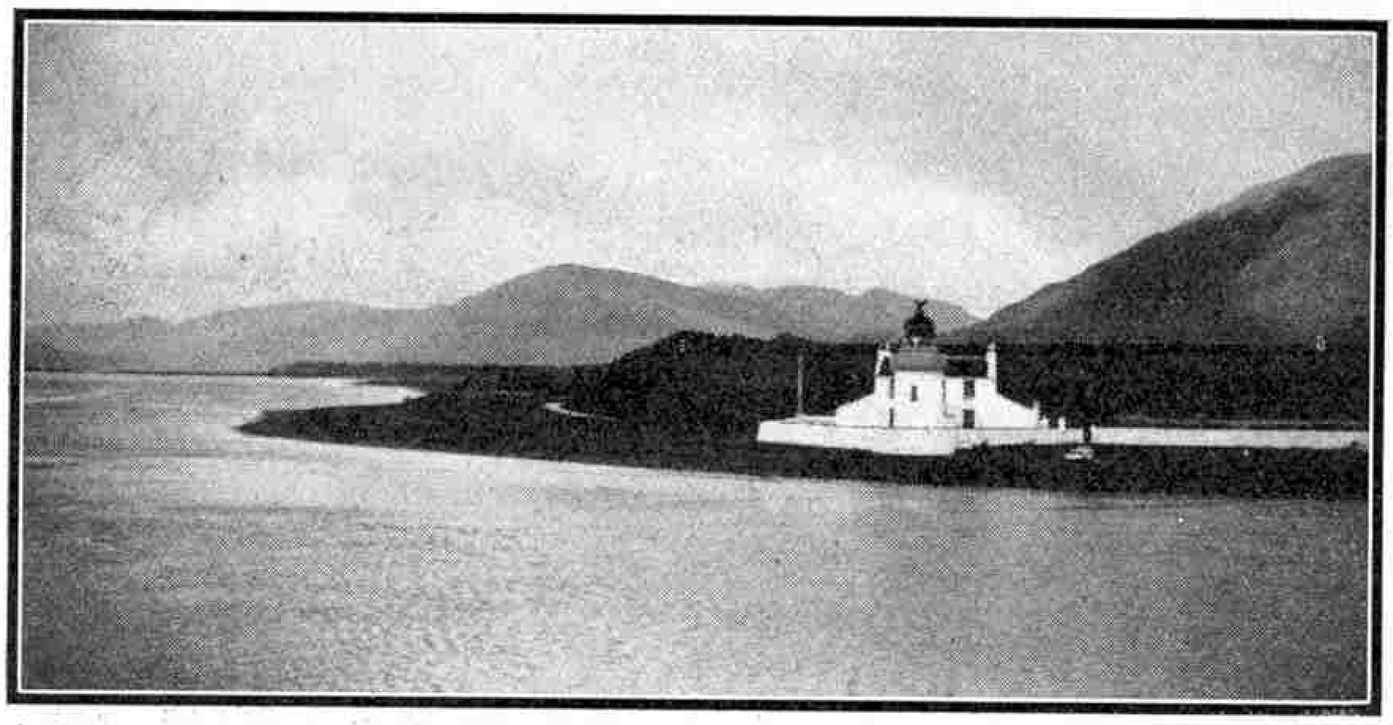
Across Scotland by Water

Oban to Inverness via Caledonian Canal

By O. S. Nock, B.Sc., D.I.C.

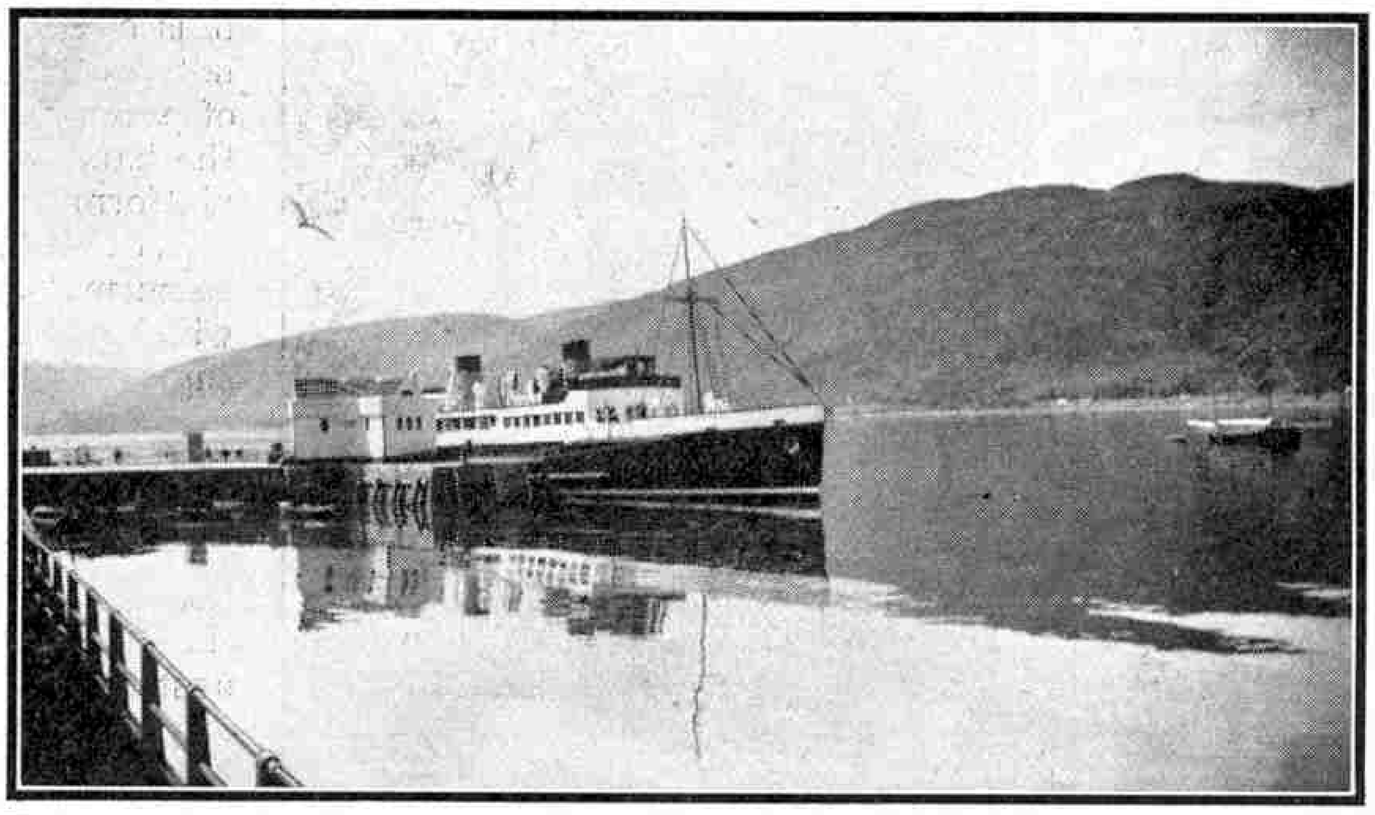
OBAN, one of the most beautiful of seaports, makes a delightful start to any journey, and especially on so brilliant and colourful a morning as that of my trip to Inverness last summer. I was pleased to find that the first stage of my journey was to be made in the Diesel-electric vessel *"Lochfyne"*; readers will remember that it was in her I made the trip from Glasgow to Ardrishaig, which was described in the *"M.M."* for July 1936. She was commanded by Captain Ewen Mackinnon, by whom I was welcomed on the bridge shortly after we got away from Oban.

With the steward's bell summoning people to breakfast—it was not quite 9 o'clock—we were gliding smoothly past the still massive shell of Dunollie Castle. This ancient stronghold of the Clan Macdougall stands on a high rock dominating the entrance to the bay, and on the north end of Kerrera, right opposite to Dunollie, a tall obelisk stands in memory of David Hutcheson, the steamboat pioneer who founded the celebrated firm of Macbrayne.



A picturesque view of the lighthouse at the Narrows, Corran, as seen from the deck of the vessel during the journey described in this article.

We came out into the open firth, to a sea sparkling with the loveliest shades of green, blue and violet, and backed in all directions by high mountains. We called at Lismore, where the only person to meet us was the island postman, and made on into the narrow channel that separates the north end of the island from the mainland. Passing abreast of Port Appin, where any passengers and freight have to be landed in small boats, we were soon out into the very middle of Loch Linnhe, that majestic waterway that leads into the very heart of the mountains. There was a brief call at Kentallen pier, which serves the district of Ballachulish, and then, as the *"Lochfyne"* swung out, her bows pointing to the blue mountains of Morvern, a break in the hills lining the eastern shore gave a first glimpse of Ben Nevis, vast, majestic, and all the more appealing under a canopy of cloud that threw the high corries into the deepest shadow. By this time we were out into mid-channel, and turning round northward to pass through the Narrows of Corran. Here the western shore runs out in a long level spit till it is a bare 300 yards from the opposite shore. On the Morvern side there is a strikingly placed lighthouse, for the tide runs strongly here and the Narrows can be very dangerous.



The M.V. "Lochfyne" made fast at Fort William at the end of the trip. The squat modern appearance of this vessel contrasts strangely with that of the "Gondolier," seen in the upper illustration on the next page.

We were now making a course through the inner reach of Loch Linnhe, and Fort William was in sight some six miles ahead. I was scanning the country ahead and the entrance to the Great Glen proper when Captain Mackinnon lent me his glass and directed me to look in a straight line with the bow of the ship. Suddenly I picked up a tall object of the most vivid scarlet standing out with startling clearness against the green background. Jokingly I exclaimed that it looked like the funnel of a ship! Mackinnon laughed, and then replied, "It is. That's the funnel of the *'Gondolier.'* You'll go through the canal in her."

We neared Fort William, rode gently up to the pier, and a little after 11 o'clock were alongside. The L.N.E.R. train took us quickly over the three miles from Fort William to Banavie, and then, having left the train, there came the curious experience of walking up a steep path in order to reach the steamer. The southern end of the canal is right at the head of Loch Linnhe, and the waterway is at once raised to a level high on the hillside by a series of seven locks known as Neptune's Staircase. The steamer starts from the highest level. It is largely on account of this series of locks that the service is not operated northward from Fort William, for to negotiate all seven would take over an hour. Our steamer, the *"Gondolier,"* a trim little paddle-boat of 141 tons, was commanded by Captain John Mackinnon, a jovial namesake of the *"Lochfyne's"* skipper.

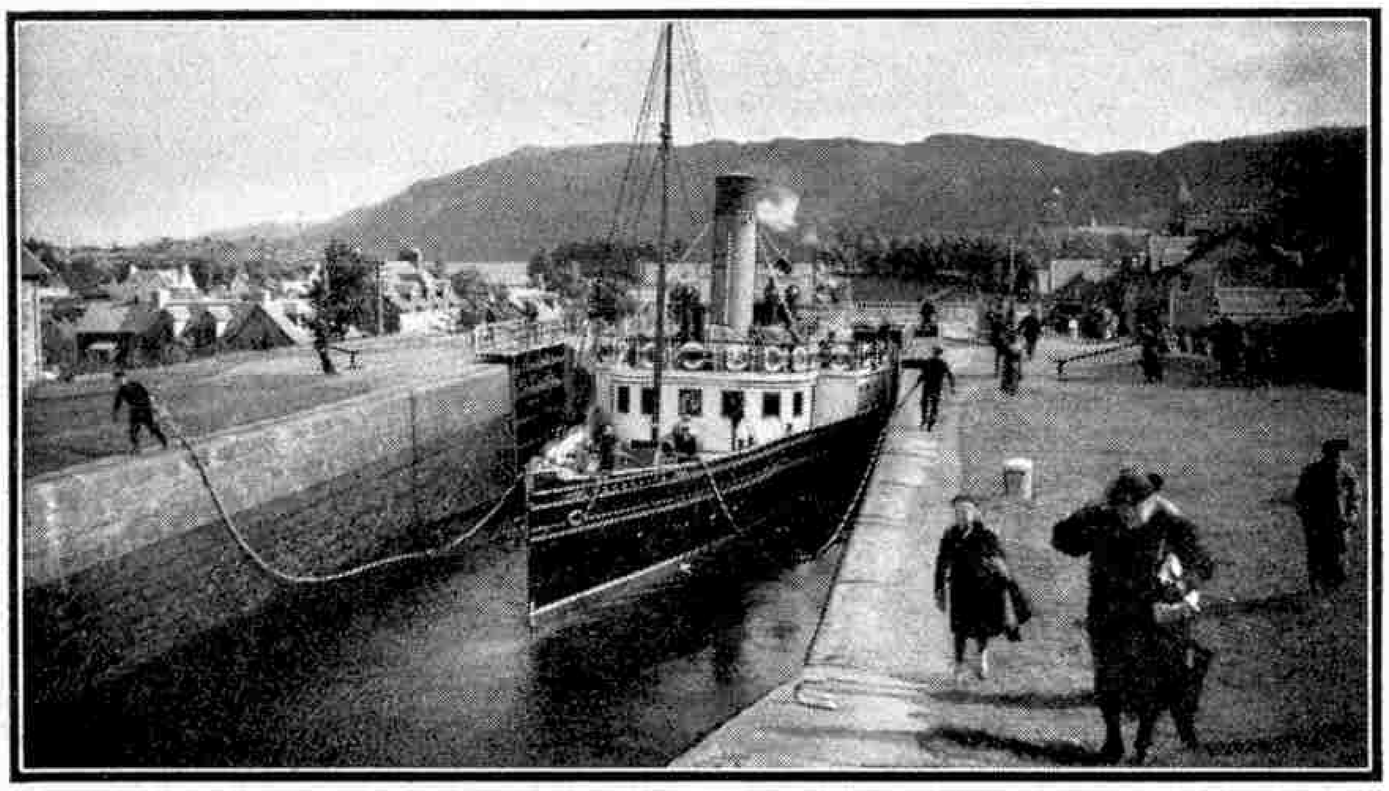
In less than half-an-hour from our arrival at Fort William in the *"Lochfyne"* we were under way, to the pleasing musical rhythm of the paddles. There was a glimpse up Glen Loy, from which a wild burn came tossing down the hillside and was carried under the canal in a short tunnel, and after negotiating several locks we entered Loch Lochy. Here the steep hillsides form one of the areas under the care of the Forestry Commission. When we came to the head of the loch a light shower was drifting across the Great Glen. The *"Gondolier"* rode gently up to Laggan Lock; the splash-splash of the paddles ceased, we coasted into the lock, and then, when almost up to the far gates, the engine was reversed for a few revolutions, stopping the ship smoothly and neatly. Throughout the canal the locks and their sluices and gates remain exactly as designed by Telford, and as built over 100 years ago.

Still higher the waterway climbs, and while the *"Gondolier"* was gradually raised to the higher level, the beauty of the scene could be greatly enjoyed. Now the gates ahead were being laboriously swung open, the engine room telegraph rang, and we were off again. The passage through the lock usually takes about ten minutes.

We steamed on down a straight deep cut where the young firs on both sides have reached a height of six or seven feet. Captain Mackinnon told me that this reach is usually referred to as Laggan

Avenue, for in days before the Great War the trees almost met overhead. When the supplies of timber that this country used to import from the Baltic States were cut off by naval blockade, all the trees hereabouts, and in many other parts of Scotland besides, were cut down to act as pit-props, railway sleepers, and in many other capacities. The Captain invited me up to the bridge, so that I could see the young trees to better advantage. The bridge of the *"Gondolier"* is literally a bridge, and no more; it is just a narrow raised platform carried across the full breadth of the vessel, quite open and devoid of any shelter. I climbed up by a vertical ladder starting from the splasher of one of the paddles.

Then we came to Loch Oich, an exquisite place where lovely woods and the mountain group dominated by Ben Tee were reflected in the still water. At the same time one notices a vague though definite change in the scenery. High mountains still line the glen on both sides, but the brilliant colouring of the west coast is gradually giving place to darker, more sombre hues. It becomes more apparent in the next stage of the canal, where the bright green grassy fields give place to wave upon wave of heathery undulations and where the outcrops of rock on the mountain sides have a pinkish colour. Instead of the regular plantations of conifers the hills are dotted with what appear to be hundreds of straight white sticks; these are the stems of dishevelled, wind-swept silver birches. So we steamed on.



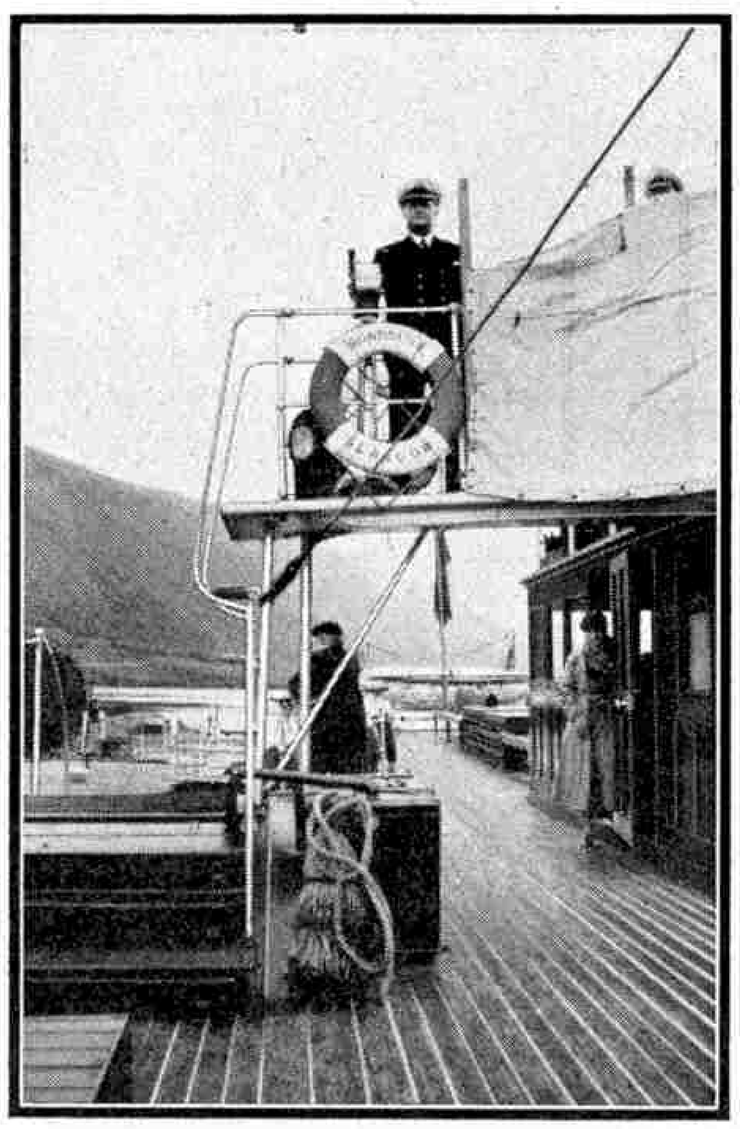
The veteran paddle steamer "Gondolier" at Fort Augustus. The vessel is negotiating the remarkable staircase of locks referred to in this article.

We were descending now, for Loch Oich, though only 103 ft. above sea level, is the highest altitude reached by the canal; and so after passing through Kyltra lock we came to the crest of the hill overlooking Fort Augustus. The waterway is of course still in a trough of the hills, but the level of the glen descends quite suddenly when less than half-a-mile from the town. The steamer has to negotiate a staircase of five locks, each following immediately after the other, and as the process takes nearly three-quarters of an hour, many passengers took the opportunity of going ashore and having a quick look round the little town. It was now 2.50 p.m. and our time of 3¾ hours for the 26 odd miles from Banavie to Fort Augustus gives a good idea of the leisurely progress made through the canal.

All the time the *"Gondolier"* was being navigated from one lock to the next, lowered a stage further, and so on, there was a fascinating view ahead, where the cut curved away from the lowest lock, of that most famous of Scottish lakes, Loch Ness. On the right bank could be seen the towers of the Benedictine monastery that now flourishes on the site of the one-time fortress. It was established as recently as 1876, and the present building incorporates some portions of the old fort.

At 3.35 p.m. we were off again, and we were launched upon the seemingly endless length of Loch Ness. Beside this long lake—it extends for 25 miles—Loch Oich and Loch Lochy are mere tarns, although the latter is 10 miles long. But Loch Ness nowadays is known less by reason of its geographical proportions than as the reputed home of an elusive Monster! Mention of this creature usually raises a laugh, at any rate in England; but in Inverness-shire there are many people, including the crew of the *"Gondolier,"* who believe in all seriousness that there was a serpent of some kind in the loch during the year 1933.

While we were passing through Loch Ness I visited the engine rooms. The *"Gondolier"* is driven by that most fascinating of prime movers, a reciprocating steam engine with oscillating cylinders; the paddle shaft is just about level with the saloon deck, and one usually finds a few passengers gazing spellbound at the whirling array of cranks and shining rods and thoroughly mystified by the rocking motion of the cylinders. The whole process of starting and controlling the engine is carried out from a platform at this same level, and it can of course be witnessed by any passenger who happens to be passing.



Captain Mackinnon on the bridge of the "Gondolier." A view looking aft over the starboard sponson.

Here I met the genial Chief Engineer, Mr. Browne. He told me that when the *"Gondolier"* was built in 1866, she was fitted with two locomotive type boilers, working at the modest steam pressure of 22 lb. per sq. in. She was constructed by Messrs. Thompson, whose yard used to be at Clydebank on the site where nowadays the greatest liners and warships are built. The principle of oscillating cylinders is employed on account of the very shallow depth of the ship; there is no space to get in a crosshead and connecting rod, and so the piston rod is extended right to the "big-end." Working at a low pressure the cylinders are necessarily large, 28 in. in diameter by 48 in. stroke, and when you go below decks, and can inspect them at close quarters, the whole job is revealed as a positive marvel of compactness.

The valve gear is a highly-intricate mechanism, a modification of the Stephenson link motion that has to allow for the rocking movement of the cylinders. Steam is admitted and exhausted through the only fixed part of the system, the trunnion bearings which are hollow and of very big diameter. The *"Gondolier"* is now fitted with a boiler of historic interest. The original low pressure ones were due for replacement just at the time when the big two-funnelled paddle boat *"Grenadier"* was burnt out in Oban bay. The boilers of this ill-fated ship were practically undamaged and so one of them was allotted to the *"Gondolier,"* and the other to a similar vessel. These boilers out of the *"Grenadier"* are of the haystack type having water tubes; they stand vertically and are fired through four doors arranged one at each corner of the stokehold. They steam up to 90 lb. per sq. in. and that of the *"Gondolier"* feeds through a reducing valve, which brings the pressure down to the correct working figure for the old cylinders.

By the time I came on deck again we had called at Foyers, a tiny place on the eastern side of the loch where a great waterfall has been harnessed for the manufacture of aluminium by hydro-electric power; and now we were steaming straight for the foot of Loch Ness. The wind was blowing up cold, and clouds were turning to the colour of steel. The grim old ruin of Urquhart Castle could just be made out as we passed wide abeam of Temple pier and the little bay, and looked westward up Glen Urquhart. Then the lessening heights on the eastern bank receded further to show the smooth gradual sweep of the land to Culloden Moor.

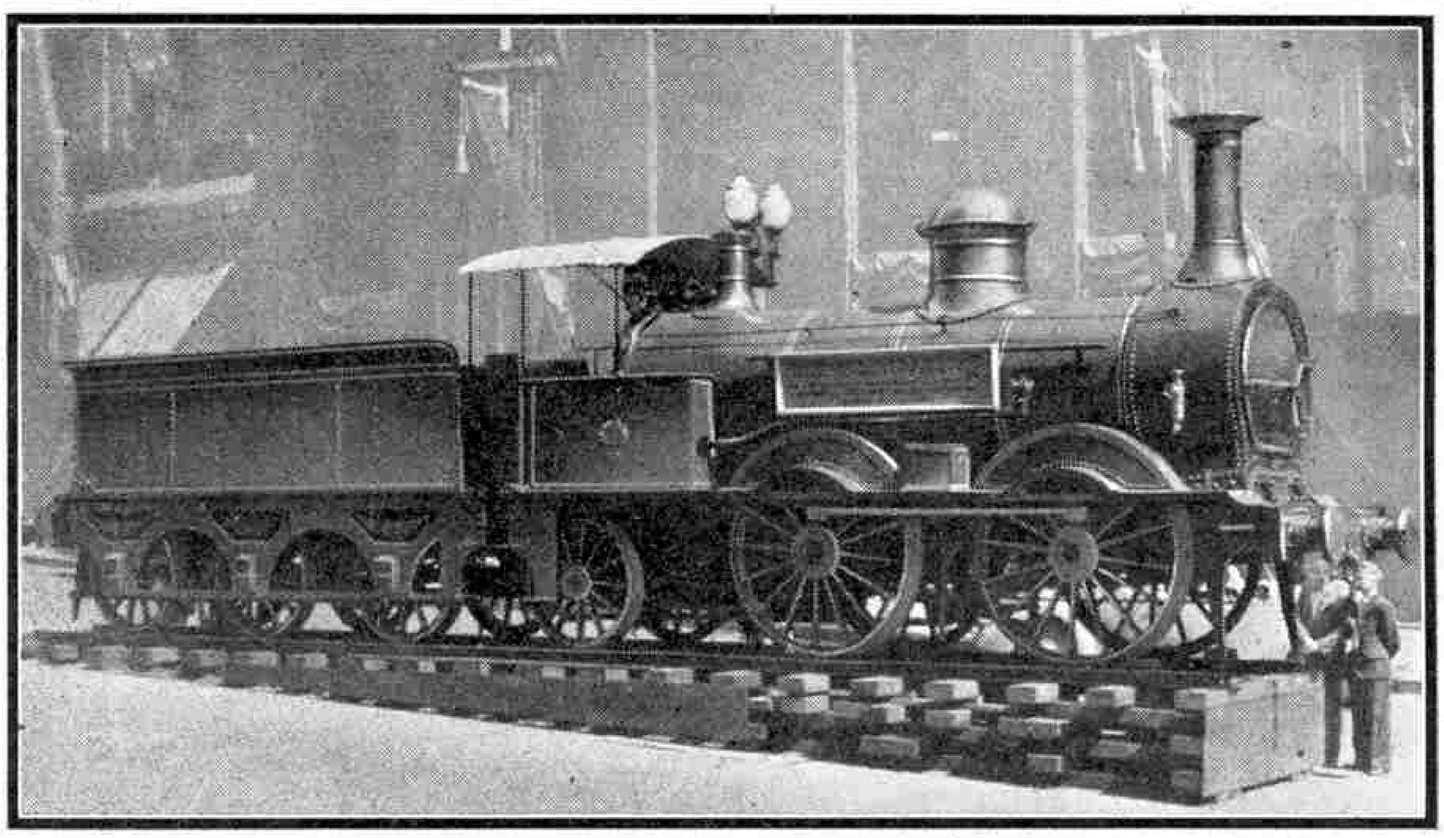
So we came to the foot of the loch. There was a glimpse into the grounds of Aldourie Castle, a rather gloomy-looking mansion on the eastern bank, and then, amid a belt of glorious red pines, we entered the most northerly reach of the canal. Presently, a final turn of the waterway revealed Inverness ahead, with the twin towers of its Cathedral and its red Castle breaking the skyline. Out beyond could be seen the coast of the Black Isle and the Moray Firth gleaming in a last burst of sunshine. In just eight hours from Banavie we glided up to Muirtown Wharf, and a few minutes later I was taking leave of Captain Mackinnon.

A Veteran Australian Locomotive

The first locomotive to run on the New South Wales Railways was exhibited at Sydney in February last during the celebrations of Australia's 150th Anniversary. This pioneer locomotive is shown in the illustration on this page. It was built in 1854 at Newcastle-on-Tyne, by Robert Stephenson & Co. and cost £3,083. Its first run in Australia was made on a ballast train on 15th May 1855, and it completed 386,636 miles before being taken off on 15th May 1877. The official opening of the line on which the engine ran took place on 26th September 1855. The distance from Sydney to Parramatta Junction, the first terminus, was 13 miles 28 chains and the time taken on the journey was 52 min.!

The locomotive and its tender were painted green lined in red and black, with the usual amount of brass and copper fittings of the period. The number appeared on the chimney, in accordance with the practice of those times. Three sister locomotives were also imported at the opening of the line and the names of famous English builders may still be noted on many engines in New South Wales. Examples are Dübs of Glasgow, now incorporated in the North British Locomotive Company Ltd., Beyer, Peacock Ltd. of Gorton Foundry, Manchester, and the Avonside Engine Company of Bristol; in addition to these are engines built by the American Baldwin Locomotive Works.

The engine was last in steam in January 1905, when the New South Wales Railways celebrated their jubilee, and has since been preserved at the Sydney Technological Museum.



The first locomotive to run in New South Wales on exhibition in Sydney recently. It was built in 1854 in England, and was in service until 1877. Photograph by our reader Trem. Watson, of Sydney.

Speeding Up Freight Traffic in the Midlands

By a slight steepening of the gradient in the L.N.E.R. shunting yard at Colwick it is estimated that there will be a saving in time equivalent to 274 working days of eight hours each. L.N.E.R. experts have calculated that if the falling gradient of these sidings were steepened very slightly, the shunting of the 4,000 to 5,000 wagons dealt with there daily would be expedited, and the saving of time effected would have beneficial results on all the freight trains in the district.

Leeds City Station

Last month the L.M.S. and L.N.E. Railways combined the two stations in Leeds, previously known as New Station and Wellington Station respectively, into a single station called Leeds City. This covers 19½ acres and has 16 platforms, and forms one of the largest provincial stations in Great Britain. A large proportion of the combined station is entirely new, for the booking hall and offices, waiting rooms and enquiry office have been built as part of the extensive reconstruction of new offices for the L.M.S. and L.N.E.R. staffs.

By this merger, the two original stations have lost their identity. Wellington Station was originally the terminus of the North Midland line, a railway constructed to connect Derby, Rotherham and Leeds. New Station was formerly the joint property of the North Eastern and London and North Western Railway Companies. It was opened on 1st April 1869 as part of what was then known as the Leeds Extension line, built to connect the Leeds and Selby railway, which had terminated at Marsh Lane, with the old Leeds Northern line at Wellington Street.

Blackpool Services

Lea Road and Salwick Stations on the L.M.S. main line between Preston and Kirkham have been closed for passenger traffic. It is hoped that the closing of these two stations will permit of a faster local service between Preston and Blackpool (Central), and simplify the working of through trains during the holiday season.

A Private Train on the L.M.S.

Considerable interest has been aroused by the Prime Minister's journey in April last from Dunrobin, the Duke of Sutherland's private railway station on the L.M.S., to Inverness behind the private engine belonging to the Duke.

Under an old right dating from the promotion and construction of the railway, the Dukes of Sutherland are entitled to run a private train between Inverness and Wick, subject to the railway company's rules and regulations, and this privilege was exercised on the occasion of the Prime Minister's recent journey from Dunrobin Castle to London. The engine used belongs to the Duke. It is an 0–4–4T built by the Atlas Engineering Company of Glasgow about 1895 and is the second private engine owned by the Dukes of Sutherland, the previous one, *"Dunrobin,"* having been sold to the Highland Railway, It became No. 118A on that line, and was broken up in 1923.

The present engine is stated to have been in steam only about three times during the past 15 years. The special train it hauled was run subject to a speed restriction of 30 m.p.h., the time allowed for the 86 miles from Dunrobin to Inverness being 3½ hours.

A tablet fixed in the cab of the engine bears the names of past distinguished passengers of the train.

"Spring Outfits" for L.M.S. Staff

Last month the first of the twice-yearly distributions of clothing took place on the L.M.S., when 100,000 members of the staff received their new uniform outfits. No fewer than 750 miles of British-manufactured cloth were used in making these uniforms. Prior to being made up into garments the clothing was subjected to exacting tests at the L.M.S. Research Laboratory at Derby.

The distribution revealed that the tallest employee taking part in it was 6 ft. 8 in. in height, and the smallest 4 ft. 3 in. The largest size in caps was 7¾ and the smallest 6. Boots and shoes also provided striking contrasts, the largest pair being of size 14 and the smallest of size 5.

Secondary Express Train Working

The running of many trains of an intermediate character, entails first class locomotive work. One service of this kind is the 7 a.m. from Euston to the north. A "Royal Scot" is usually employed on this train, but on a recent occasion "5P5F" 4–6–0 No. 5378 was at its head and was set a formidable task, for the load behind the tender was 460 tons.

Mr. O. S. Nock, to whom we are indebted for these notes, joined the train at Watford. For the 29.2 miles from there to Bletchley only 31 min. are allowed. Starting splendidly, No. 5378 gradually accelerated and sustained 56 m.p.h. up to Tring. Speed rose to exactly 80 m.p.h. below Cheddington, and on past Leighton Buzzard, where the gradients flatten out into practically dead level, a steady 75–76 was maintained into Bletchley.

Equally fine work followed. Wolverton, 5.7 miles from the restart, was passed at 67 m.p.h. and on the succeeding ascent to Roade, speed did not fall below 60 m.p.h. until the train was carefully slackened to 30 m.p.h. in order to cross over to the "slow" lines. A smart recovery with a top speed of 66 m.p.h. brought the train into Northampton on time. The Northampton loop includes some considerably heavier grading than the main line and after a short length of easy grades comes a 10-mile bank at 1 in 230. No. 5378 was put to it with magnificent effect here, accelerating to a steady 47 m.p.h. on the 1 in 230, and passing Long Buckby, 9.7 miles, in 15 min. The summit was breasted at 51½ m.p.h. The driver was L. Walls of Edge Hill.

A Cosmopolitan Railroad!

"The Railway Gazette" draws attention to a recent statement in the American journal, *"Railway Age,"* that the Missouri Pacific Railroad serves 13 towns and cities which bear the names of foreign capitals! This cosmopolitan system runs to Paris, London, Moscow, Ottawa, Athens, Delhi, Warsaw, Rome, Cairo, Algiers, Prague, Belfast and Monrovia!

New Freight Vehicles for the L.M.S.

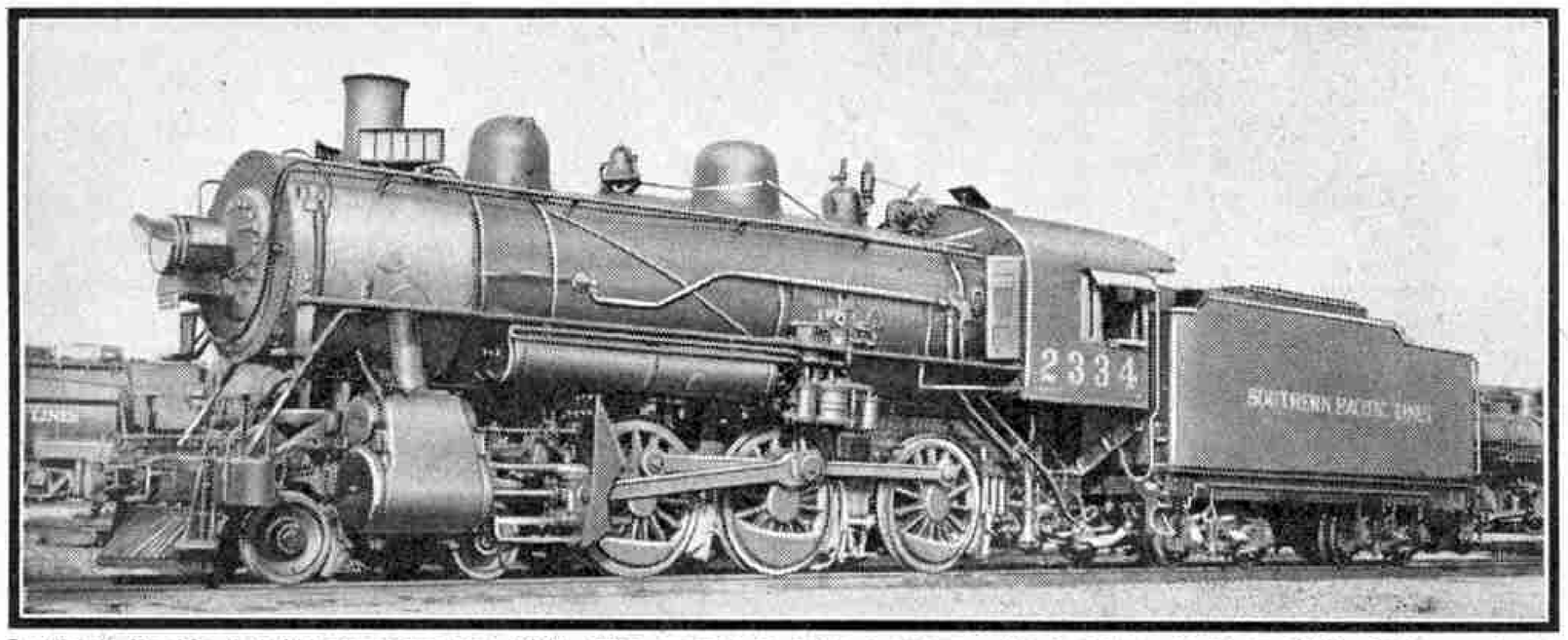
The L.M.S. announce that in connection with the 1938 wagon renewal programme, orders have been placed with British manufacturers for a total of 87 new freight and service vehicles. These include 75 twelve-ton sleeper wagons, ten 35-ton bogie wagons and one 10-ton creosote tank wagon, with one ballast plough van, which is used for spreading out evenly new ballasting material provided in connection with relaying operations over a section of track.

Electric Signals on L.N.E.R. at Hull

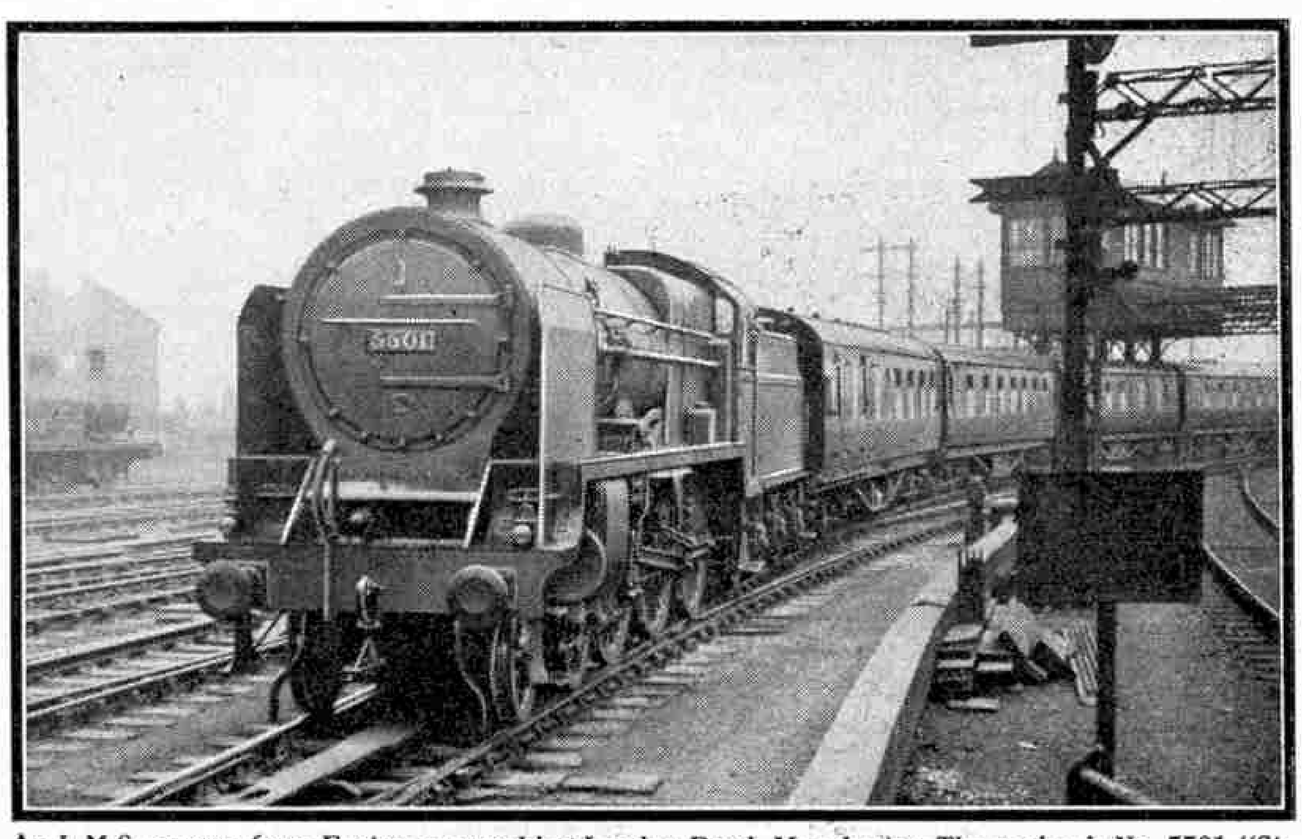
The signalling system at Paragon Station, Hull, of the L.N.E.R., has been completely modernised and an electric searchlight signalling system is now in operation. The electrification scheme has been in progress for some months and the whole of the station with its 14 platforms, together with the approaching lines, has been brought under the control of one signal box that replaces the two that formerly controlled the area. The new box is of modern design and by means of small thumb switches 99 separate pairs of points, 32 colour light signals, 56 shunting signals and 18 route indicators are operated. About 150 miles of steel armoured cable have been used in connecting the new signal box to these various points and signals, whilst another 60 miles of special flame-proof wire has been employed in connecting up the apparatus in the signal box itself.

In the interest of simplification, and also to help engine drivers, the number of new searchlight signals has been reduced to a minimum by the provision of electrically-lit route indicators. In addition the signals have been placed as nearly as possible in the direct line of sight of the train men by means of gantries and overhanging brackets situated directly over the lines to which the signals refer.

Similar work is in hand at York, Edinburgh and Doncaster and on the main line between Northallerton and Darlington.



Southern Pacific 4-6-0 locomotive No. 2334. This engine is quite a veteran, having been built in 1908; it has features characteristic of American locomotive design of that time. Photograph by Allan Youell, of Pasadena, California.



An L.M.S. express from Euston approaching London Road, Manchester. The engine is No. 5501 "St. Dunstan's," of the "Patriot" class. Photograph by J. P. Wilson, Nottingham.

"The Sunday Scotsman"

The L.N.E.R. announce that the world's record non-stop run between London and Edinburgh will be made on seven days a week during the coming summer. Previously this record has been maintained on weekdays only by *"The Flying Scotsman."*

The new non-stop train will be known as *"The Sunday Scotsman"* and the northbound and southbound trains will leave the London and Edinburgh termini respectively at 11.0 a.m., each making the journey in 7 hours. The 10.0 a.m. departure time for *"The Flying Scotsman"* on weekdays of course will be continued.

New locomotives and coaches are being built at Doncaster, and these will be used for both *"The Flying Scotsman"* and *"The Sunday Scotsman"* services. The locomotives are streamlined, and the carriages embody all the latest developments in passenger comfort, incorporating the experience that has been gained from the *"Coronation"* and *"The Silver Jubilee"* streamlined trains. A feature of the new trains will be that special buffet facilities will be provided in addition to restaurant cars.

The L.M.S. "Duchess" 4-6-2s

The ten 4–6–2s now being built at Crewe will be numbered 6225-34 respectively, and will be named after the Duchesses of Gloucester, Norfolk, Devonshire, Rutland, Hamilton, Buccleuch, Atholl, Montrose, Sutherland and Abercorn.

The first five engines, Nos. 6225-9 inclusive, will be streamlined in a similar manner to the blue and silver "Coronation" engines, but they will be painted in the standard L.M.S. red livery. Nos. 6230-34 will not be streamlined, and they will thus resemble the original "Princess" 4–6–2s. The new engines will be used principally on the Anglo-Scottish services.

A Ship Goes By Train

The new luxury motor vessel that is being built by Vickers-Armstrong Ltd., Barrow, for service with the L.M.S. fleet on Lake Windermere, was recently conveyed in a special train to Lakeside. Owing to its size it had to be loaded in sections and re-assembled after unloading at Lakeside. The launching ceremony takes place early this month. The new vessel will have accommodation for 800 passengers and represents the second important addition to the L.M.S. Windermere fleet during the past two years.

During last year the L.M.S. carried more than 492,000 passengers on Lake Windermere, an increase of 87,000 over 1936.

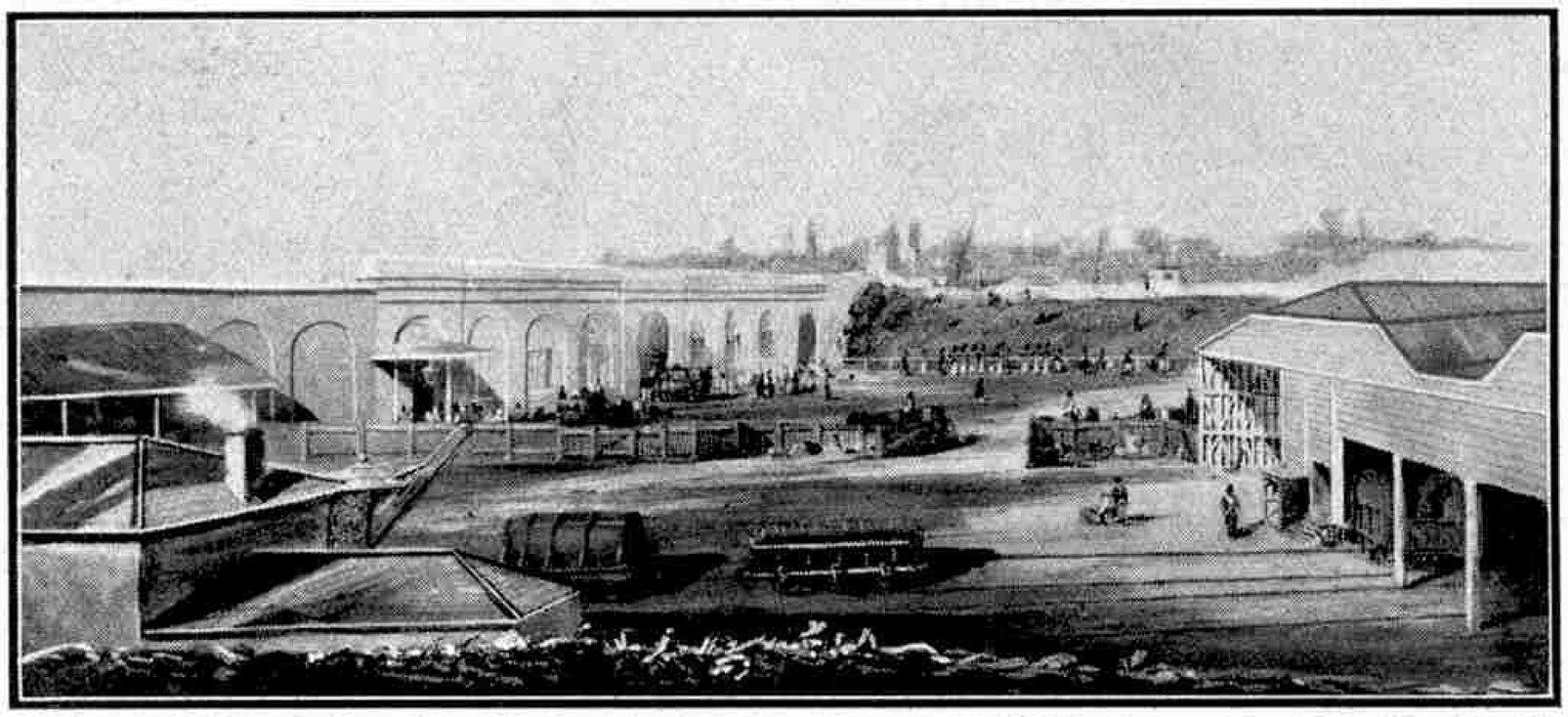
Great Western Railway Centenary

The Royal Road to the West

THIS month the Great Western Railway completes a century of public service, for the first section of its line, from the original terminus at Paddington to Maidenhead, was opened on 4th June 1838.

The company was the only one of our big systems to retain its identity and its original name in the grouping of 1923. It owes its origin to the desire to provide railway communication between London and Bristol, which was then the second city in the kingdom. The promotion of a "London and Bristol Rail-Road Company" had been proposed as early as 1824, but it was not until 1832, by which time the success of the Liverpool and Manchester Railway had been assured, that any definite steps were taken. Four Bristol merchants then revived interest in the scheme, and eventually a survey of the route was arranged for and Isambard Kingdom Brunel appointed Engineer.

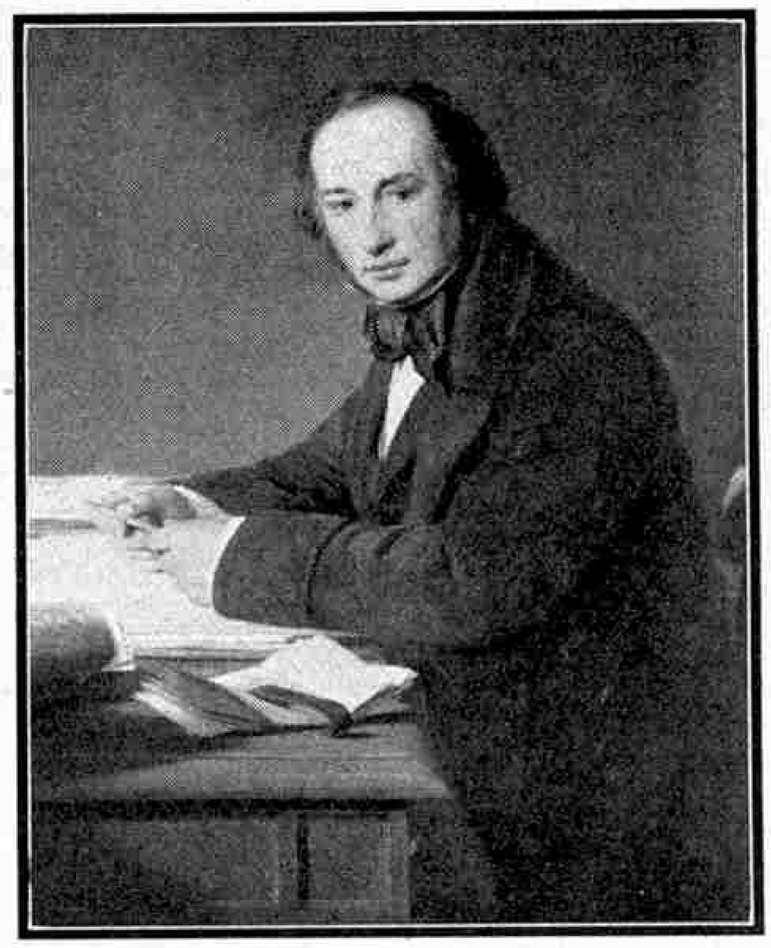
The company was incorporated in 1835 and work on the line was then put in hand. Certain deviations from the original route were made in 1836 and 1837 and there was also a change in the plans in regard to the company's London terminus. There was a proposal that the G.W.R. should be accommodated by the London and Birmingham Railway at Euston. This scheme fell through, however, and the G.W.R. were empowered to bring the line to "a certain space of ground adjoining the basin of the Paddington Canal in the Parish of Paddington."



Paddington in the early days. The original station, which was in use until 1854, is shown to the right of the view. The illustrations on this page, and the upper one on the opposite page, are reproduced by courtesy of the G.W.R.

Although the public opening of the Paddington-Maidenhead section took place on 4th June, there had been an experimental run four days previously over the same course from Paddington to Maidenhead. The first public services were timed to begin at 8 o'clock in the morning from each end of the line, but the more decorous departure time of 11 o'clock was observed for the experimental run, on which the train carried the Directors and a large party of their friends. At Ealing the train was welcomed by "a salute of ordnance from one of the embankments!"

On the return journey a halt was made at Salt Hill, near Slough, where a "substantial repast" was served in the usual manner of those days. The 19 miles from Salt Hill to Paddington were covered in 34 min. at an average speed of 33½ m.p.h. It is related that Mr. Guppy, one of the original Bristol promoters, distinguished himself during the return journey by walking over the roofs of the carriages from one end of the train to the other while it was actually in motion!



Isambard Kingdom Brunel, the first Engineer of the G.W.R.

For many years G.W.R. was remarkable for employing a much wider gauge than that adopted as standard by other companies. Before the construction of the line was commenced, Brunel, with characteristic originality, proposed that it should be laid to a larger gauge than that employed on other systems, in order to allow really high speeds to be reached with absolute safety on the well-graded route he secured. His intention was to build coaches with large wheels, between which the bodies were to be slung, for the sake of steadiness, and this made the wider gauge necessary. The plan was adopted, and he laid the line to a gauge of 7 ft. 0¼ in. instead of the 4 ft. 8½ in. adopted by Stephenson.

G.W.R. track was different from that commonly employed elsewhere in another important respect. The rails, which were bridge-shaped, were laid not in chairs supported on cross sleepers, but on longitudinal timbers that were bolted at intervals to cross-transoms, or distance pieces, lying between them. This timber framework was at first held down by beech piles driven into the ground, but the piles were found to give trouble and their use was abandoned.

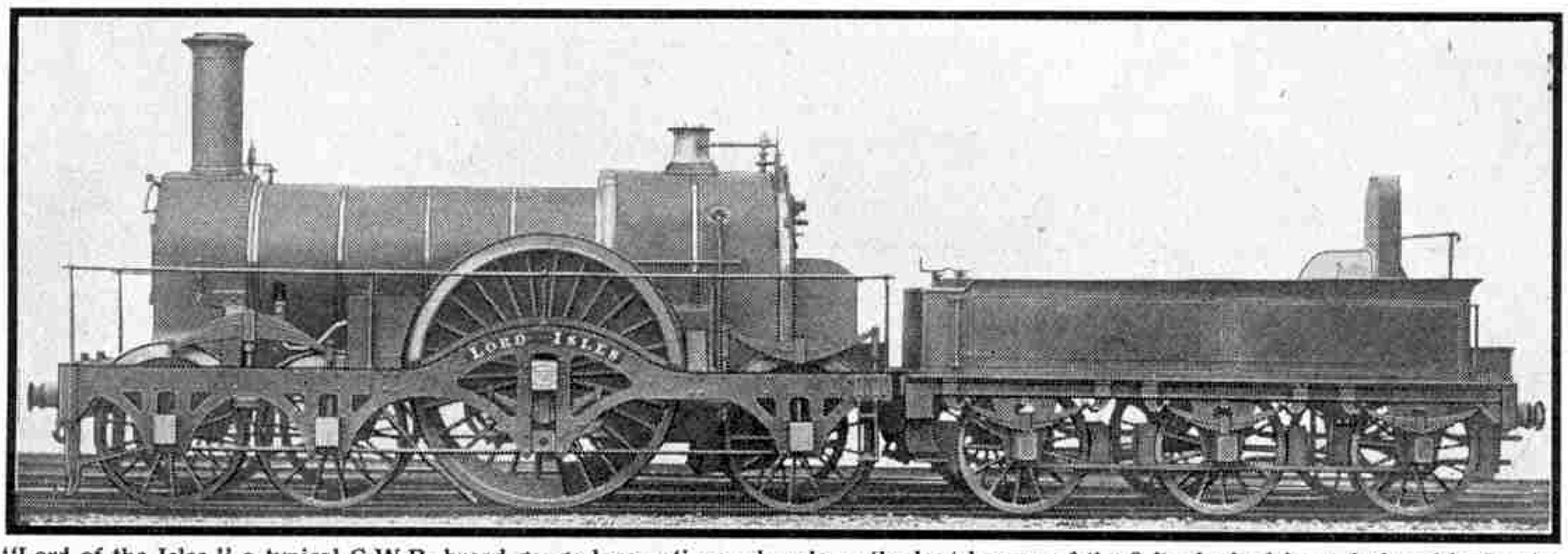
The G.W.R. was conceived and laid down on a grand scale and although the broad gauge track has long since disappeared, some of the remarkable bridge and tunnel works of Brunel still survive to-day. Difficult engineering work was involved in completing the original line, which was opened throughout to Bristol in 1841. The boring of Box Tunnel was stigmatised as "monstrous and extraordinary, most dangerous and impracticable," but gloomy prophecies of its effect on passengers remained unfulfilled.

The "large scale" characteristics also were evident when the Locomotive Department under Daniel Gooch got into its stride at Swindon. There were some uncertainties during the opening period when, with certain exceptions such as "*North Star*," a somewhat miscellaneous collection of more or less freak locomotives was all that was available. Afterwards large and powerful eight-wheeled engines were employed for G.W.R. express trains at a date when much smaller engines with six wheels, and some even with four wheels, were in use elsewhere. Gooch, who was the Locomotive Superintendent from 1837 until 1864, was the designer of the remarkable 4–2–2 single-drivers with 8 ft. wheels which, more than any others, will always be associated with the first 50 years of the existence of the G.W.R. These engines, in fact, had G.W.R. requirements so well in hand that with little modification the design was adhered to from 1847, when the earliest of the series were built, until the abolition of the broad gauge in 1892.

The first locomotive of this class was also the first engine to be completely constructed at Swindon. Its appearance was indirectly due to the gauge question, which had been under consideration by a Parliamentary Commission as a result of the troubles experienced at points where the broad gauge G.W.R. met the lines of other companies. During the sittings of the Commission a great deal of attention was paid to locomotive efficiency, and comparative trials between broad and narrow gauge engines were decided upon. After some preliminary running Gooch was instructed to prepare a design for an engine that would show what the broad gauge could do. "*Great Western*," as the engine he

produced was appropriately named, was then the most powerful locomotive in the country.

The death knell of the broad gauge had already been sounded by the passing of the Gauge Act in 1846, which laid down the standard of 4 ft. 8½ in. for future lines, with certain exceptions. The G.W.R. were allowed to proceed with a broad gauge line from Oxford to Birmingham, provided that they laid in a narrow gauge rail as well, and the process of mixed gauge working instituted in this manner was really the thin end of the wedge that led finally to the abolition of the broad gauge. Paddington saw its first narrow-gauge locomotive in 1861; in 1868 came the first conversion to the narrow gauge, and in 1892 the final stage of the process took place.



"Lord of the Isles," a typical G.W.R. broad gauge locomotive and perhaps the best known of the 8 ft. single-drivers designed by Daniel Gooch. Engines of this type remained in charge of the chief broad gauge expresses for over 40 years.

At first the train services showed little evidence of the high speed capabilities of the broad gauge, but in 1845 it was resolved to accelerate the trains and in that year Exeter was reached from Paddington in five hours, the trains passing from Bristol over the metals of the Bristol and Exeter Railway, a broad gauge concern closely associated with the G.W.R. and ultimately absorbed by it. At that time these Exeter trains were the fastest in the world, making an average speed of just under 40 m.p.h. The timing was subsequently reduced to four hours and a half, and then fluctuated somewhat between 4 hr. 25 min. and 4 hr. 45 min. In 1862 competition from the London and South Western Railway, whose service was for a time quicker than that of the G.W.R., caused the restoration of the 4½ hour schedule from London to Exeter.

Other associated companies ultimately taken over, by which Paddington was linked with Penzance, included the South Devon and the Cornwall lines. These had been built with G.W.R. approval and under the engineering guidance of Brunel. Crossing from Devon to Cornwall over the River Tamar the line passes over the remarkable Saltash Viaduct, the last bridge built by Brunel and indeed the last of all his works. The two main spans consist each of a single arched tube, with the ends of each tube resting on piers rising from the water. Suspension chains join the ends of each tube and are braced to them along their length. Each span therefore forms virtually a bowed trussed girder, from which the deck of the bridge is suspended. In Cornwall the numerous valleys were crossed by a notable series of wooden viaducts so sound in design and construction that the last of them—the Collegewood Viaduct—has only recently been replaced by a more modern structure.

The most prodigious engineering work on the G.W.R., the Severn Tunnel, came after the time of Brunel. Its purpose was to provide a more direct gateway to South Wales and to Ireland than the old route via Gloucester. The construction of the Severn Tunnel was an epic struggle against the difficulties occasioned by the water breaking into the workings. Even now millions of gallons are pumped out daily by the powerful pumps installed, and 36,556,218 gallons have been raised in a single day. Construction was in progress for 13 years, from 1873 to 1886, and 76,000,000 bricks were used. With a length of 4 miles 624 yards, it is the longest tunnel in the United Kingdom, and the longest underwater tunnel in the world.

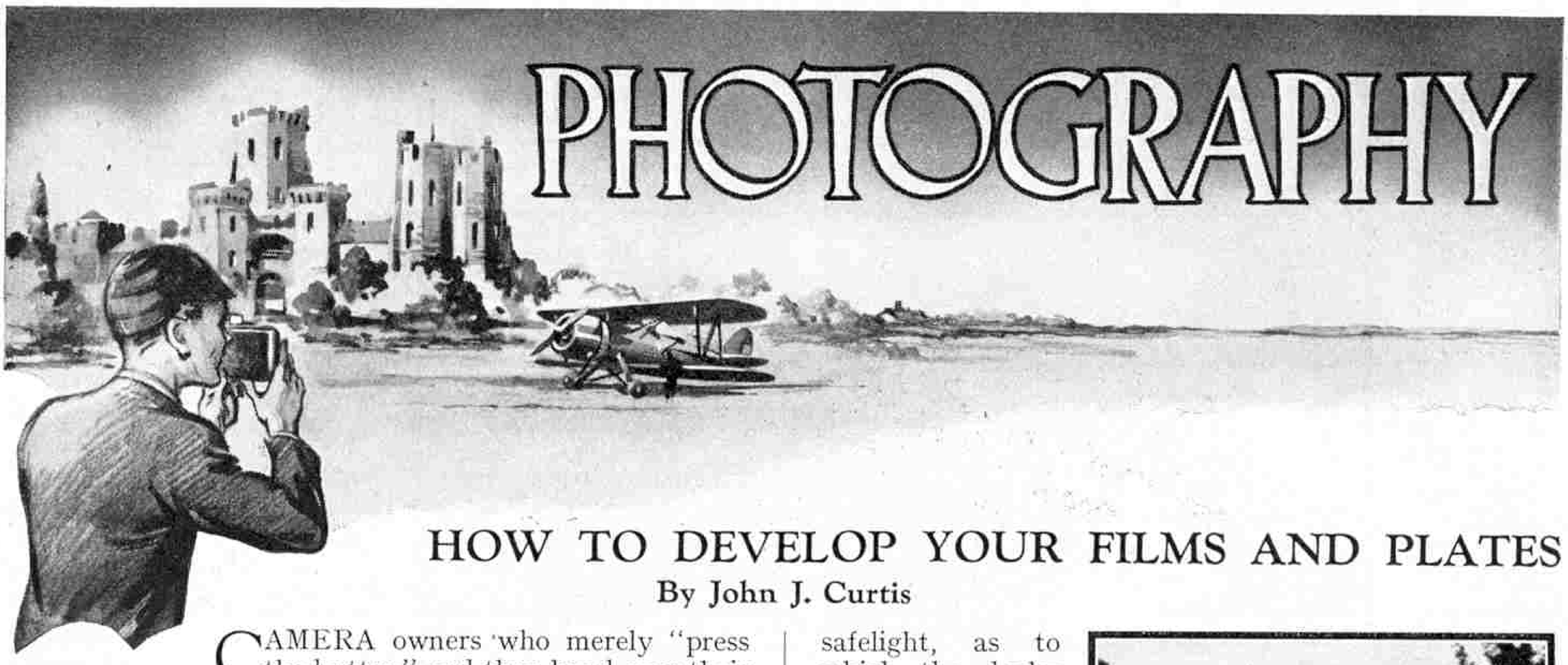
If the engineering developments of the G.W.R. of more recent years have been less spectacular, they have been none the less important. By providing cut-off lines the route to the West of England has been shortened. More recently important facilities have been provided for through traffic at important junctions such as Westbury and Taunton. The old route to Birmingham and the North from Paddington also has been shortened by the construction of the Banbury line, and another development has been the growth of a new "West to North" main line.

As a result of such operations the services to-day are worthy successors of the old broad gauge trains. In 1845 the 9.45 a.m. from Paddington had to run to Didcot in 67 min. for the 54 miles. Developments brought such trains as the *"Flying Dutchman,"* and the first *"Cornishman"* of 1890; then the *"Cornish Riviera Limited,"* of 1905. From these the *"Cornish Riviera"* service developed, and for 20 years this train made the longest non-stop run in the world, covering the 225¾ miles from Paddington to Plymouth in four hours. More recently the *"Cheltenham Flyer,"* with its speed of 71.3 m.p.h. over the 77¼ miles from Swindon to London, held for some years the proud position of the world's fastest train, and is still one of the fastest in this country.

In addition to providing the usual safeguards, the G.W.R. take special measures to ensure safety of operation. All the main line routes are fitted with the G.W.R. system of automatic cab signalling and train control apparatus, which gives a definite indication to the engine driver of the state of the road ahead, and makes it impossible for a train to pass a home signal at danger. There is little doubt that the efficiency of this system has contributed to the immunity of G.W.R. trains from serious accident for many years. The use of this special system is fitting for the line that was the first to make regular use of the electric telegraph to assist in more safe and efficient working.

An aristocrat of trains, the G.W.R. "Cornish Riviera Limited" with a "King" at its head. Special vehicles are used exclusively on this service. The engine carries the special identification number used on the G.W.R. during the summer period of dense traffic.

The G.W.R. has been called the "Royal Road," for it is the proud boast of the company to have carried members of the reigning house more frequently than any other British railway. The association of the G.W.R. with Royalty commenced in 1839, when Prince Albert travelled from Slough to London. Queen Victoria however did not venture on a journey by rail until 1842, when she travelled from Slough to Paddington and back. A famous journey made by the late King George V, as Prince of Wales, was in 1903 on the occasion of a Royal visit to Cornwall. The special train was run to Plymouth, via Bristol, a distance of 245¾ miles, in just under four hours at an average speed of 63.4 m.p.h. This was a remarkable run for the time, especially as in the still recent Victorian days trains conveying Royalty were not usually scheduled at particularly high speeds, and eventually it led to the introduction of the *"Cornish Riviera Limited."*



HOW TO DEVELOP YOUR FILMS AND PLATES

By John J. Curtis

CAMERA owners who merely "press the button" and then hand over their films to the local chemist to be developed and printed lose a great deal of the real fun and interest of their hobby. Many people have the idea that development and printing are difficult, that they necessitate a dark room, and that the operations involved are "messy." This is quite wrong. The various operations are simple and straightforward, and are not messy unless they are made so. Of course there are some folks who get into a mess over the simplest jobs, but they have only themselves to blame! As for a dark room, this is certainly very nice, but it is not by any means necessary. Development operations can be carried out in any room that can be made dark for a short time, and as a general rule this means that the work must be done at night. Almost the only outstanding advantage of the dark room is that it is available during daylight.

Now let us suppose that the reader has decided to develop his own films. There are two ways of doing this; one is what might be called the "dish" method, and the other the "tank" method. We will take the dish method first. The room chosen as the scene of operations should if possible have a water supply, which means that it must be the bathroom or the kitchen. The latter is to be preferred, because if by any chance developing solution is spilled, the subsequent remarks of the domestic authorities are likely to be less violent! All the work can be done in darkness, but this is a great nuisance, and it is better to provide a safe light. If electric light is available a special bulb giving a deep red light can be used. Alternatively a simple dark room lamp, obtainable from any photographic dealer, should be used. For panchromatic films greater precautions must be taken, and operations must be carried out either with a special safelight, as to which the dealer will advise, or in complete darkness throughout.

This illustration shows the method of passing a roll of film through the developer in the dish development process.

The apparatus required consists of a photographic dish, preferably half-plate size, $6\frac{1}{2}$ in. by $4\frac{3}{4}$ in., a jug to be filled with water, and a bowl or pie dish, which usually can be "borrowed" from the kitchen. A measuring glass, one ounce or larger, and a thermometer complete the equipment; the thermometer may be one of the special photographic type, or may be the bathroom thermometer "borrowed" for the occasion.

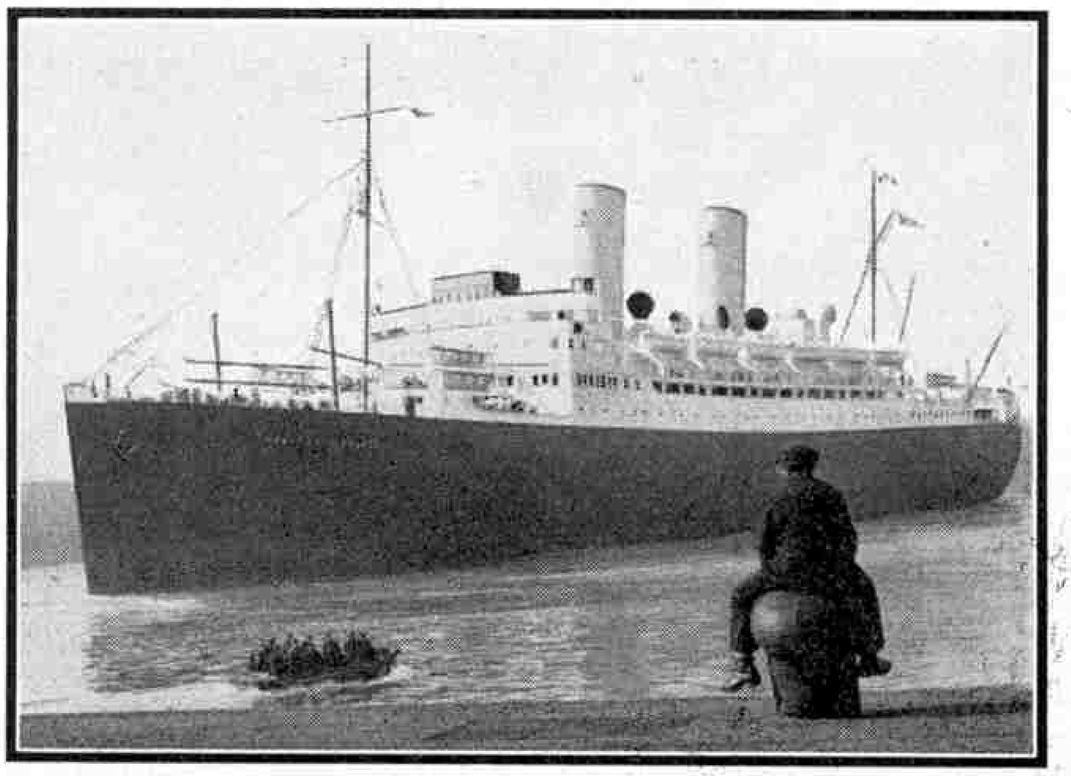
This photograph, reproduced by courtesy of Ilford Ltd., is a very striking portrait of an elephant in unusual surroundings.

Coming now to the chemicals required, it is best first to make up what is known as the "fixing" solution. This may consist of four ounces of "hypo" dissolved in a pint of water, or better still, may be made up from one of the acid fixing preparations sold for the purpose. The fixing solution should be made up some time before it is required for use, as hypo, in dissolving, causes the temperature of the water to fall appreciably. This solution should be poured into the bowl or pie dish, and care should be taken to rinse the fingers after dealing with it, because a trace of hypo solution in the developer is liable to cause trouble.

There are many developers to choose from, but for our purpose the most suitable are those that are issued with what are known as "Time and Temperature" tables. Each of these tables states for its particular developer the time required for development with a solution of a certain strength and at a certain temperature. Further, the instructions provide for slight variations to suit different makes of film. Among the developers with which such information is issued may be mentioned "Azol," "Rytol," "Certinal," "Vedol" and "Rodinal." To take an example, let us suppose we are using "Azol" at a strength of one

part of developer to twenty-four parts of water, and that the film we are going to develop is a "Selochrome." We take the temperature of the solution and find that it is 65 degrees. The tables then tell us that we shall require to develop our film for 8½ minutes.

This is all the information that is needed; so now, after pouring the solution into one of our dishes, we turn out the white light and switch on the ruby light. Next we take the spool that is to be developed, unroll it, and remove completely the paper strip. As wet film is somewhat slippery to hold it is a good plan to attach a metal paper clip to each end of the film. Then we take one of the clips in each hand, and lower the film into the jug of water, and by raising one hand and lowering the other at the same time give the film a see-saw motion through the water and maintain this until the film is quite limp. Now note the time, transfer the film to the developer in the dish, and continue a see-saw motion through the solution until the 8½ minutes have expired. Then transfer the film to the fixing solution, pass it with a see-saw motion through this until the grey cloudiness is well on the way to disappearing from the back of the film, and then leave the film submerged in the fixing solution until the cloudiness has completely disappeared, and for three or four minutes longer. The white light can now be safely switched on.



"Oh! To be a Sailor." A prize-winning snapshot from the April Photo Contest by J. L. Graves, Stone.

The final stage is to wash the film in running water for half-an-hour or so, or in several complete changes of water. This can be done in the bathroom wash-bowl, or in a fair-sized bowl stood in the kitchen sink. One of the best ways of overcoming the tendency of the film to curl up is to fasten its two ends together by means of a clip, and to place the loop thus formed round a small basin placed in the centre of the wash-bowl.

Finally the film should be hung up to dry in some airy place where dust cannot get at it. The metal paper clips used during development to hold the film will serve to hang the film, the lower clip acting as a weight to prevent the film from curling up.

The only important difference between the development of plates and films is that in dealing with plates it is the developer that is kept moving. The plate is laid in the bottom of the developing dish, film side upward of course, and the developer poured over it without any preliminary wetting of the plate. Special care should be taken to send the first wave of developer evenly over the plate and to ensure that no part of the plate becomes uncovered throughout the time of development. The dish must be rocked steadily but gently to keep the developer moving over the plate throughout the operation. Air bubbles on the surface of the plate must be avoided at all costs; if they appear, the rate of rocking must be increased. Fixing and washing operations follow, as with roll films.

"Our Young Gardener." This picture by A. B. Bishop, Bristol, was awarded Second Prize in the A Section of the April Photo Contest.

The tank method of development of films is simpler, and avoids the arm-aching work of dish development; but it involves the purchase of a tank, and therefore its first cost is rather higher. There are two main types of tank. Those known as "daylight loading" permit the whole of the operations, including the loading of the film into the tank, to be carried out in ordinary light. The other type, known as "daylight developing," require darkness or a safelight during the loading of the film, but once this has been done, the developer poured in, and the tank closed, the ordinary light may be switched on. With either type the tank is kept closed until development is complete, and then the developer is poured off and clean water run into the tank to rinse the film. The tank is again emptied, and the fixing solution poured in. When the fixing is complete, the film must be washed. With many types of tanks it is necessary to remove the film for washing and in such cases the process is carried out in the manner adopted after dish development. Other types of tanks, however, provide a special washing device that permits running water to circulate freely inside the tank. It is only necessary to place the tank under a water supply, after emptying out the fixing solution.

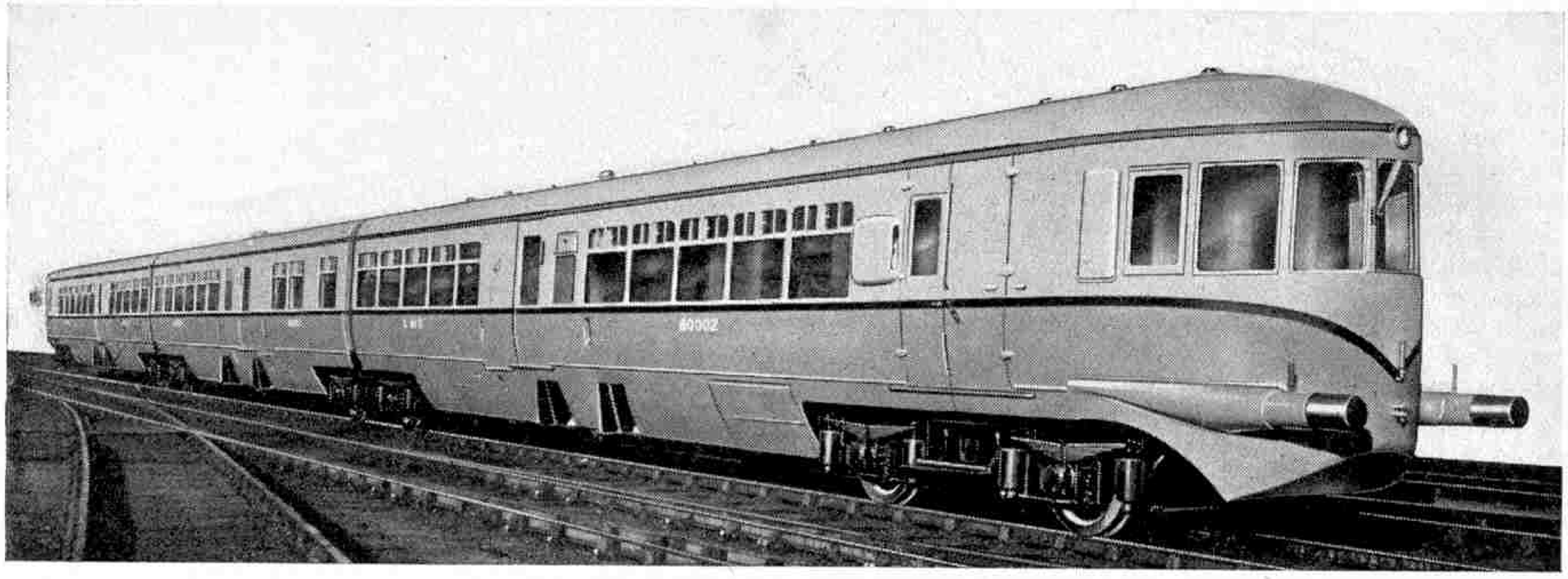
There are several reliable makes of roll film tanks available at all prices up to thirty-five shillings. Full instructions for use is given with them all, and no one need have the slightest difficulty in their operation. There are also tanks for the development of plates and filmpacks.

Before we leave the subject of development we urge every one of our photographic readers to make a point of developing at least one roll of film as a trial. One gets an amazing thrill out of doing one's own photography, but what is more to the point is the surprising improvement in the quality of the photographs that are produced in this way. The simple fact of developing a film teaches a lot about exposure; and later, when the photographer comes to the making of his own prints—either by contact printing or by enlarging—he will find that the care and time given to the proper development of his films has been well spent.

Finally, doing one's own developing is economical. The cost of the chemicals used for developing and fixing an average spool of eight exposures is less than a penny.

British Streamlined Diesel Train

Interesting L.M.S. Experiment



BRITISH main line railways have not made very extensive use of Diesel traction for passenger trains so far, although the G.W.R. have popularised heavy oil railcars for local and even express passenger services. Special interest therefore is attached to the L.M.S. three-coach articulated Diesel train illustrated on this page, which has recently been completed at Derby. The L.M.S. are the first British railway company to experiment seriously with such a train, but if the progress of the streamlined express Diesel services now in operation in America is any criterion of future developments, it may not be long before trains of this kind will be challenging steam-driven trains for supremacy on British railways.

This new L.M.S. streamlined train embodies several features new to British practice and has been designed with the object of exploring the possibilities of this type in developing traffic on secondary lines, and also of comparing Diesel-driven units with steam trains operating in similar conditions. The 77-mile stretch of the L.M.S. line between Oxford and Cambridge has been chosen for the experimental running of the new train.

The train consists of three articulated units, and in colour is a complete departure from the usual L.M.S. practice, for the standard maroon has not been used. Instead the upper portion of the coaches is painted aluminium colour, and the lower panelling Post Office red. A valance is fitted to cover the underframes between the bogies, and the ends of the train are "faired," while the spaces between the cars are covered by rubber shrouding. Thus the train presents a smooth and scientifically streamlined shape.

The complete three-car train weighs only 73 tons in full working order, which is considerably less than half the weight of a steam train, composed of a locomotive and vestibule coaches, affording the same accommodation. High-tensile structural steel, which affords great strength combined with minimum weight, has been employed in the construction of the train, and extensive use has been made of welding in building it.

A further factor in weight reduction is the special method of coach articulation that has been employed. This is one of the many novel features of the train, for it has never previously been incorporated in a new train in this country. A horizontal link 15 ft. long is centrally pivoted on the bogie centre, and at the ends of the link a connection is made to the coach underframes. The horizontal link is hinged to allow for slight vertical movement between the bodies.

The train is driven by six Leyland 125 h.p. Diesel engines mounted on the underframes. The power from each engine is transmitted through a hydraulic torque converter, which provides very smooth acceleration from the start until the higher speeds are reached, when the engine crankshaft is coupled direct to the propeller shaft. This is tubular and is fitted with flexible couplings. The final drive is taken through gear-boxes mounted on the axles, and the engines are geared for a maximum speed of 75 m.p.h. All six engines can be controlled simultaneously by electro-pneumatic equipment from either of the driver's compartments at the ends of the train, and there is accommodation for luggage at each end also.

The striking new three-car Diesel train recently completed by the L.M.S. at Derby for service on the line between Oxford and Cambridge. The train is streamlined and articulated, and is capable of a speed of 75 miles an hour. The lower panelling is painted Post Office red and the upper portion aluminium colour. Photograph by courtesy of the L.M.S.

The driving gear includes a "dead-man's pedal," which is held down while the train is running, and on release automatically applies the brakes. The control of the engine throttles is effected by means of compressed air supplied from six compressors, and the driver is able to operate all of them simultaneously by means of a special control valve in the cab. Air-operated sliding doors give access to and from the coaches. They are under the control of the guard, and the driver cannot start the train while any one of them remains open, for the door mechanism and the engine controls are interlocked.

The complete train has been designed by Mr. W. A. Stanier, Chief Mechanical Engineer of the L.M.S., and the power units and transmission have been installed by Leyland Motors Ltd.

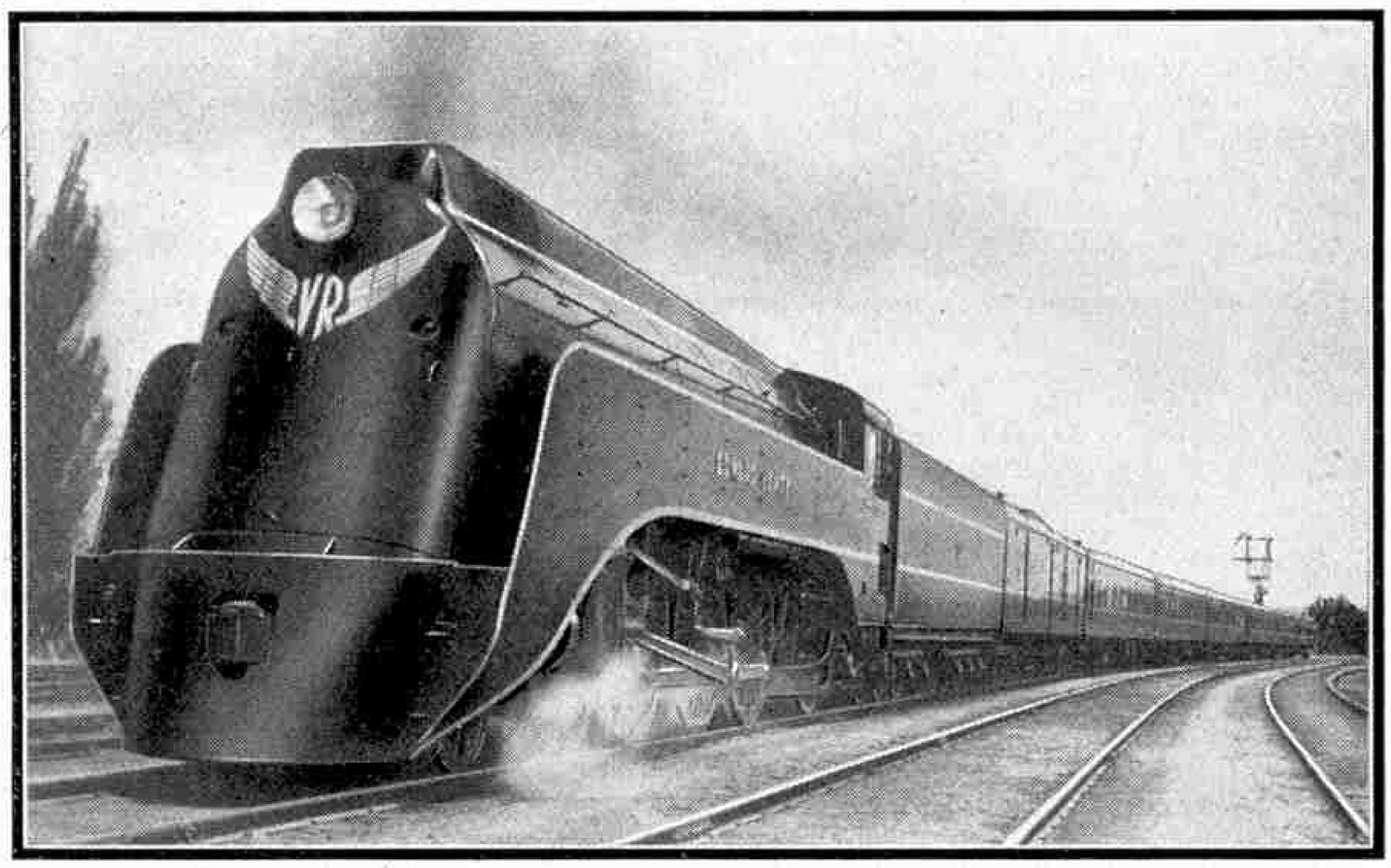
The "*Spirit of Progress*"

A New Australian Streamlined Train

RECENT developments show that the railways of Australia are keeping pace with railway progress in other countries. In the "*M.M.*" for last November we described the new Diesel-driven train, the "*Silver City Comet*" introduced by the New South Wales Government Railways, and now a further step has been made with the introduction on the Victorian Railways of the "*Spirit of Progress*," a thoroughly modern streamlined train hauled by a steam locomotive of very striking appearance. This splendid train, which is shown at speed in our illustration, runs non-stop daily between Melbourne and Albury, where connection is made with the New South Wales Government Railways to Sydney.

It is coloured royal blue throughout, with two parallel bands of gold running along it from the front of the locomotive to the rear of the last coach. The coaches are of all-steel construction and are air-conditioned throughout.

The streamlined engines used for this new service are of the "Pacific" type. There are four of them, named respectively "*Matthew Flinders*," "*Edward Henty*," "*Sir Thomas Mitchell*" and "*G. J. Latrobe*," in commemoration of outstanding figures in the early history of Victoria. They are not of a new design, but are actually the well-known "S" class enclosed in a streamlined casing. They have three cylinders measuring 20½ in. by 28 in., and driving wheels 6 ft. in diameter, the boiler pressure being 200 lb. per sq. in. Their non-stop run is one of 190 miles, and to enable them to make it they have been provided with extra large tenders, each weighing 106½ tons in working order and accommodating 8½ tons of coal and 13,000 gallons of water.



The "Spirit of Progress," the new streamlined express of the Victorian Railways running between Melbourne and Albury. Photograph by courtesy of the Victorian Railways.

The journey time to Albury, which is on the New South Wales border, is 3 hr. 50 min., while the return journey to Melbourne is made in 3 hr. 35 min. The first 68¼ miles out of Melbourne are double line, but the remaining distance to Albury is single, controlled by electric staff, and with passing loops so laid out that staff changing is effected with automatic apparatus at speeds up to 60 m.p.h. The run is not an easy one. In the first 33 miles from Melbourne trains have to climb to Heathcote Junction, the summit of the Continental Divide. This is 1,145 ft. above sea level, and the gradients by which it is reached steepen to a maximum of 1 in 50. On the single-line section there are 14 slacks for staff exchanging, including one to 20 m.p.h.; and through Seymour there is a long 25-m.p.h. speed restriction.

To allow a higher speed to be reached than formerly, a certain amount of track relaying, realignment and canting has been carried out on various parts of the line, and the highest speed now allowed is 70 m.p.h. The restrictions are carefully observed throughout, however, the engines being fitted with self-recording speed indicators to ensure this.

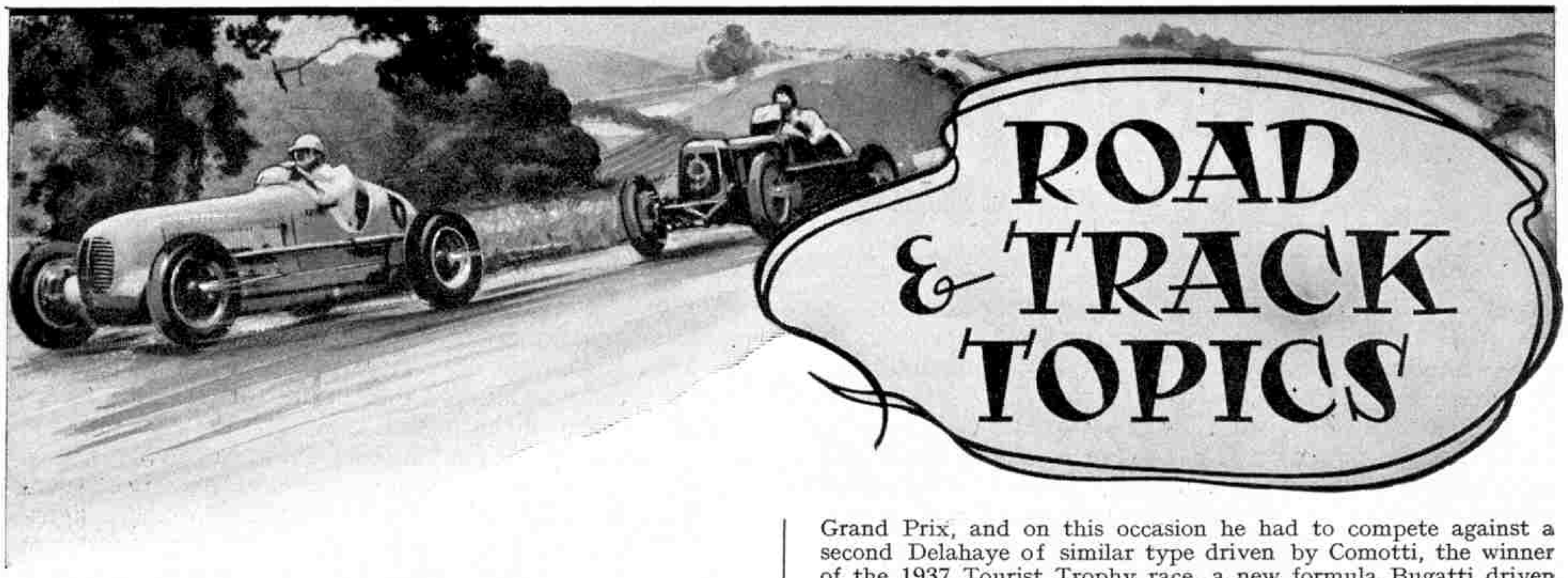
The coaches weigh 42½ tons each and have many interesting features. They are made of "Cor-ten" steel, a lightweight alloy combining great strength with high resistance to corrosion. Special care was taken in designing a sound-deadening foundation for the floor, and the walls and roofs of the coaches also have been effectively insulated against noise and heat by cementing to them a layer of sound-proof felting, against which are secured sheets of crinkled aluminium foil. These measures, together with the provision of automatic couplings, friction draft gear, and rubber padding in the four-wheeled bogies, have been very effective in reducing train noises, even when travelling at top speed. Vibration also has been eliminated, and air conditioning contributes greatly to the comfort of passengers.

The "*Spirit of Progress*" has been decorated in a striking manner with panels of various Australian timbers. Flowery walnut, and jarrah, an Australian hardwood, are used in the smoking compartments. Royal walnut is employed in the first-class ladies' compartments, and other compartments have panels of silver silkwood and ribbon walnut. Chrome leather is used for the upholstery and red, blue and grey are the predominant shades.

Special attention has been paid to the design of the seats, which have been skilfully sprung and padded to make them comfortable for the long non-stop runs of the train. The windows have fixed double panes of unshatterable glass, and the outer one in each case is fitted flush with the outside panelling of the coach in order to reduce wind resistance.

A point of interest in the "*Spirit of Progress*" is the ingenious lighting scheme that has been adopted. A lamp giving a soft diffused radiance is set in a frosted globe in the ceiling of each compartment, and above each seat is a reading lamp, operated by an independent switch, the rays of which do not disturb other passengers in the same compartment.

The last coach of the train, known as the parlour-observation car, has a rounded tail and large windows through which passengers, comfortably seated in armchairs and on settees, can admire the passing scenery.



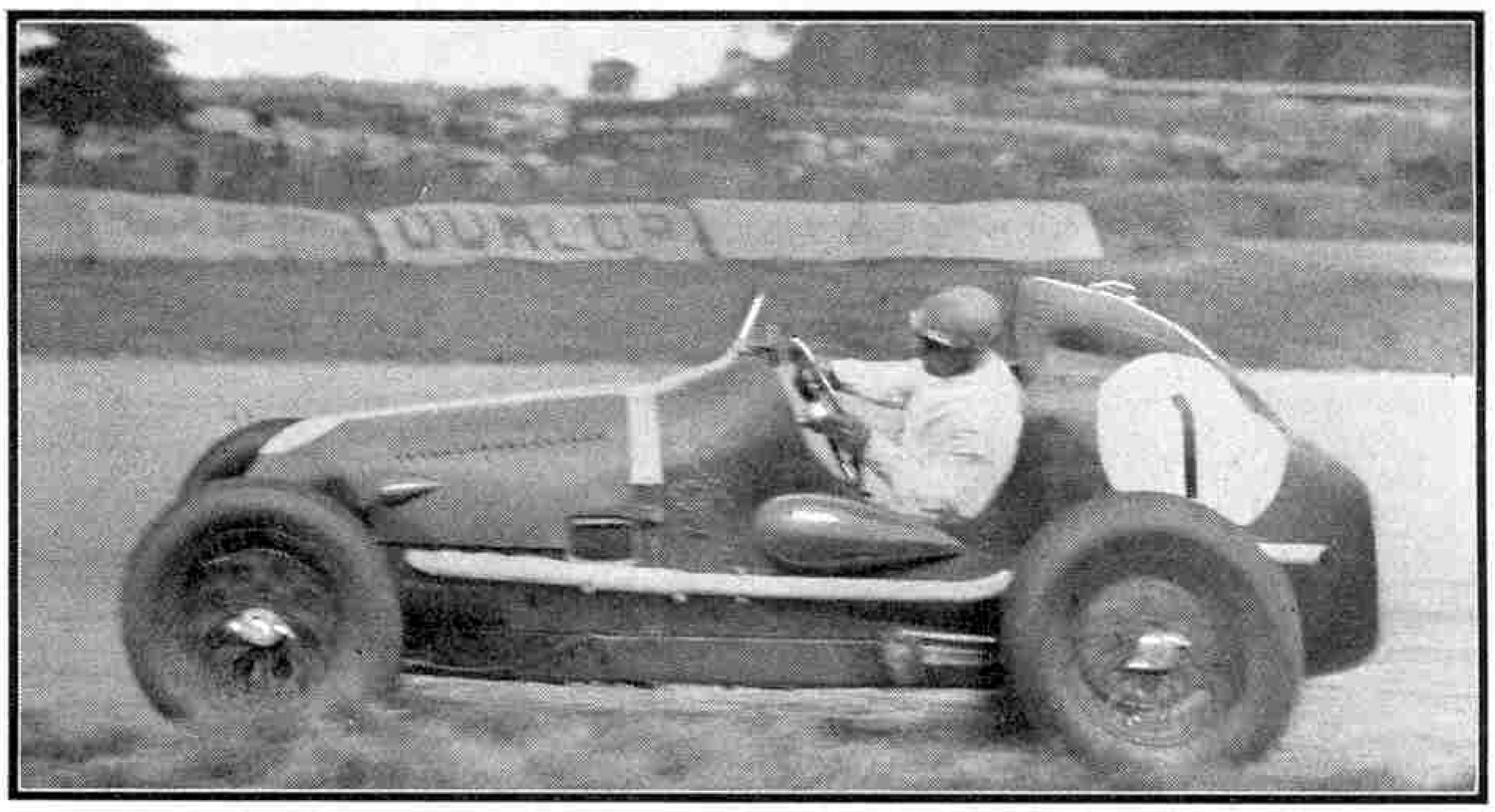
ROAD & TRACK TOPICS

Baby Car Wins Coveted Empire Trophy

The Austin Seven racing cars achieved a great triumph when one of these amazing little cars won the coveted British Empire Trophy Race at Donington Park. It was driven by C. J. P. Dodson and maintained an average speed of 69.62 m.p.h. A photograph of the car, taken while it was travelling at high speed during the race, is reproduced on this page.

The race was run over a distance of 200 miles, made up of 64 laps, and the 22 entrants included E.R.A., Maserati, Riley, M.G., Delahaye and Alfa-Romeo cars. Second and third places were obtained by E.R.A. cars, driven respectively by Prince Birabongse, who races under the name of B. Bira, and Billy Cotton, whose co-driver was W. E. Wilkinson.

Several alarming incidents occurred both during practice and the race itself. During a practice run Bira's E.R.A. skidded off the road while travelling at high speed and dashed into a group of trees, but miraculously avoided them all. Later an Alfa-Romeo ran up the banking and overturned, but fortunately the driver was unhurt. R. Mays narrowly averted disaster when the brakes of his E.R.A. failed at 130 m.p.h.



An Austin Seven, driven by C. J. P. Dodson, travelling at high speed during the British Empire Trophy Race at Donington Park. Dodson finished first, his average speed for the race being 69.62 m.p.h. Photograph reproduced by courtesy of The Austin Motor Co. Ltd., Birmingham.

The New Grands Prix Cars

Cars built to conform with the new rules governing Grands Prix had their first opportunity to display their capabilities in the Pau Grand Prix, run over a course at Pau in the South of France. The result was a win for a 4½-litre unsupercharged Delahaye, driven by René Dreyfus, which emerged victorious from a hectic battle with a 3-litre supercharged Mercedes driven by the famous Caracciola. A second Delahaye piloted by Comotti obtained third place.

The new formula machines of course will be modified and adjusted as considered necessary in the light of the experience gained in actual racing, and at present therefore they must be regarded as still in the experimental stage. The race revealed that the new Delahayes are very fast and possess very rapid acceleration from slow corners. The Mercedes do not appear to have such rapid acceleration, but are likely to be formidable rivals on the straight.

Nuvolari, the famous Italian driver, was to have driven in the race, but during practice his new 3-litre Alfa-Romeo caught fire and was completely destroyed, Nuvolari managed to jump clear and escaped with only slight burns and a few scratches.

Dreyfus and his Delahaye were again seen in action in the Cork Grand Prix, and on this occasion he had to compete against a second Delahaye of similar type driven by Comotti, the winner of the 1937 Tourist Trophy race, a new formula Bugatti driven by P. Wimille, the famous French driver, which was making its first appearance, and a supercharged Maserati driven by Bira. There were also an Alfa-Romeo, an Alta, a Delage and several other cars. Although the fight was mainly between Bira and Dreyfus, the fastest machine in the race was Wimille's Bugatti, which at one time was travelling at 147.2 m.p.h. Unfortunately the Bugatti had to retire owing to some trouble that developed, and from then onwards Dreyfus and Bira fought out the issue between them. Dreyfus won, with Bira finishing second and Louis Gerard's Delage third. Thus each of the first two races run under the new formula rules was won by an unsupercharged French car.

Coronation Trophy Race at the Crystal Palace

B. Bira, who for two successive years has won the B.R.D.C. Gold Star for road racing, has again commenced the season with a series of fine wins, including the Coronation Trophy, the Campbell Trophy and the Cork International Light Car Race. In addition he obtained second place in the Cork Grand Prix, and also in the British Empire Trophy Race at Donington Park.

In the Coronation Trophy Race Bira put up some very rapid driving and during the final equalled the existing lap record for the course of 2 min. 2.8 sec. The cars were grouped in three classes and handicapped according to the size of their engines, and the race was run in a series of heats. In order to qualify for the final each car had to complete at least six laps in its heat.

One of the most exciting incidents of the race occurred during the sixth lap of the first heat, when two E.R.A. cars driven by Bira and Connell respectively were engaged in a thrilling duel for first place. Connell's machine was slightly in the lead, and when rounding a bend its front brakes jammed and the car broadsided across the path of its rival. Both drivers handled their cars magnificently, but it was impossible to avoid a collision, and while racing side by side the two machines touched one another twice. Somehow or other the two separated their cars and without a pause continued the race, with Bira in the lead.

Thrills at Brooklands

A crowd of between 20,000 and 30,000 people watched Bira score his second big triumph when he won the Campbell Trophy, which was the principal event in the Easter Meeting at Brooklands.

Almost from the start the race settled down to a continuation of the oft-fought struggle between the Siamese Prince in his 1½ litre E.R.A. and A. C. Dobson in a similar car, and spectators

were thrilled as these two cars sped round the tricky corners. Bira's average was 73.70 m.p.h. for the whole of the 10 laps, which is nearly half a mile per hour faster than the single lap record of 73.26 set up last year by P. D. Walker, also in an E.R.A. In the struggle for supremacy Bira did two laps at an average speed of 75.71 m.p.h., thus creating a new lap record. Dobson's best lap speed was 75.43 m.p.h.

Motor Vehicles for Air Raid Work

As part of their air raid precautions schemes many towns are now being equipped with vehicles fitted with apparatus for speedily decontaminating and reopening streets in which gas bombs have been dropped, and for extinguishing fires caused by incendiary bombs. Usually these vehicles are designed so that in peace time they can be used for ordinary municipal work, such as refuse collecting and street washing, while in the event of an air raid they can be quickly adapted to defence work.

Decontaminating a road after an air attack with gas bombs. Bleaching chemical is being sprayed over the affected area. The photographs on this page are reproduced by courtesy of Dennis Bros. Ltd., Guildford.

A vehicle of this kind, manufactured by Dennis Bros. Ltd., Guildford, is shown in the illustrations on this page. It is designed to transport men and materials rapidly to sites where bombs have been dropped, and to distribute chemicals to render gas harmless. Apparatus is provided also for washing away the residue of the contents of the bombs and for extinguishing fires.

The vehicle consists essentially of a four-wheeled tractive unit and a two-wheeled trailer. The tractive unit is fitted with a water tank of 700 gallons capacity, and carries one man in the cab besides the driver. Two other men are carried on a step at the rear, while two more are provided with seats on the trailer. The tractive unit is fitted with a powerful pump and hose connections to the tank, while the trailer carries fire-extinguishers, bleaching materials, tools and tackle.

On arrival at the scene of operations, the bleaching material is pumped in a light spray over the affected area, which is then scrubbed with hard brushes to enable the chemical to react upon the gas. Passages and alleyways too narrow to allow the vehicle to enter can be sprayed through long hoses, which also form part of the standard equipment. Fires at some distance from the road also can be attacked, while chemical extinguishers are provided for dealing with oil and petrol fires.

After the work of decontamination is completed, any residue from the bombs is removed by means of a strong jet of water to the road-side gutter, and is then flushed into the sewer.

The air raid precautions vehicle shown in action in the upper illustration, complete with trailer and equipment. In peace time the vehicle can be used for street washing or refuse collecting.

A Marble Road in Italy

Several miles of a great new motor highway in the neighbourhood of the famous Carrara quarries have been paved in solid marble! Driving on the smooth surface of the road seems like travelling on a magic carpet, and the lights of cars running on it have to be dimmed owing to the brilliant reflection from the marble surface.

Italian 1,000 Miles Race

Travelling at the very high average speed of 84.45 m.p.h., an Alfa-Romeo car driven by Biondetti, was once again successful in winning the Italian Mille Miglia, or 1,000 Miles Race. In another Alfa-Romeo Pintacuda, who has twice previously won this famous race, made a very great effort, and a grim battle was fought out between him and his rival. Pintacuda gave a display of superb driving, and at one time the two machines were almost level, but that was the end of Pintacuda's effort, for from this point onwards Biondetti had it all his own way, and completed the course nearly two minutes ahead of his rival, who came in second. Another Alfa-Romeo driven by Dusio and Boninsegni was third.

In the 2-litre sports class the British driver A. F. P. Fane was first with his Frazer-Nash-B.M.W., which covered the distance at an average speed of 74.05 m.p.h.

New Attacks on the World Land Speed Record

Capt. G. Eyston, the holder of the world's land speed record, intends to make an attempt to raise the record still higher this summer, and his huge car *"Thunderbolt,"* the fastest car in the world, is being specially modified and altered for the purpose. The car is being fitted with a new body, which is about 6 ft. longer than the original one and is of a more perfect streamline type, and its wheels will be encased with spats to stop air eddies under the chassis. In addition the cockpit is being raised on both sides to form blinkers for the driver and to prevent him from being blown out when the car is travelling at the high speeds anticipated. The tail of the original *"Thunderbolt"* ended rather abruptly, but that of the new body is gracefully tapered to form a gradual sweep to the rear.

Another famous British driver who intends to attack the record this year is Mr. John Cobb. He will make his attempts in a great new Railton car that has been built specially for the purpose. The *"Railton"* weighs 3 tons, and in place of a conventional frame it has a backbone consisting of a rectangular steel girder, which terminates in a fork at each end. The *"Railton"* is propelled by two 12-cylinder Napier engines, each of 1,250 h.p., which are arranged one on each side of the backbone. The overall length of the car is about 29 ft., which is about 7 ft. shorter than that of *"Thunderbolt."* The driver's cockpit is almost in the nose of the car and is provided with a curved front window. The body is beautifully streamlined and is perfectly smooth, its outline being unbroken by any projecting fins, the only projection on top being the cockpit cover.

World Tour by Automobile

Evidence of the increasing interest that is being taken in long-distance motoring is to be found in the popularity of such events as the Monte Carlo Rally and the R.A.C. Rally. Both of these events, however, are likely to be completely eclipsed so far as interest and excitement is concerned by the greatest Rally of all, a motor tour round the world that is to be organised this year by the International Association of Recognised Automobile Clubs, commencing 12th November.

Private cars only are eligible for this tour, and competitors will have the choice of three itineraries. The first consists of a rally to Calcutta, the competitors returning by car to Bombay and then by sea from Bombay to Marseilles, Genoa or Trieste. The second is similar to the first as far as Calcutta, but then continues on to Saigon in Cochin China. From Saigon, competitors may either return direct to Europe by sea, or visit the Dutch East Indies, returning from Batavia to Marseilles by sea. The third is similar to the second as far as Saigon, and then continues on around the world, the return to Europe being made through Japan and the United States.

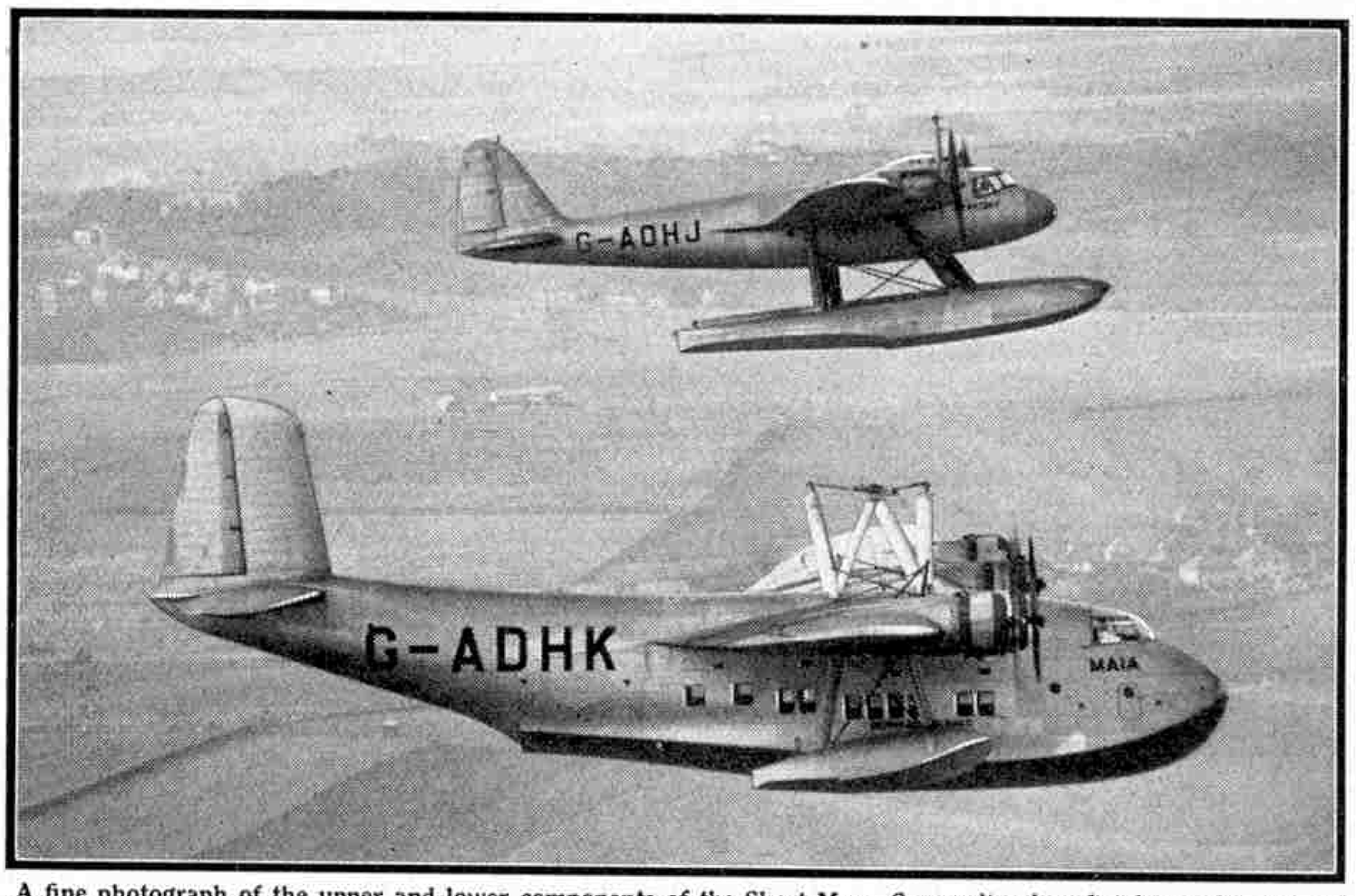
The Short-Mayo Composite Aircraft

Seaplane Launched from a Flying Boat

By T. R. Robinson

ONE of the greatest difficulties met with in the operation of long range commercial aircraft is the launching of a heavily-laden machine, encumbered, as it must necessarily be, by its cargo of freight or passengers and its weighty tanks of fuel. Once a successful take-off has been achieved, the load can be carried with ease, but the problem of attaining the desired air speed and height is difficult to solve. The recently-built Short-Mayo Composite aircraft, which has now successfully completed its preliminary tests, surmounts the difficulty by the ingenious principle of launching a seaplane, which carries out the flight, from a larger "assisting" flying boat after the two have taken off as a combined unit and climbed to a certain height.

It is not the first time that the method has been tried, for in 1916 a Bristol "Bullet" was launched from the upper wing of a "Baby Porte" flying boat. The Short-Mayo, however, is the first scientifically-designed composite aircraft built with the object of launching one aeroplane by combining it with another, and subsequently separating the two when the necessary height and speed have been reached.



A fine photograph of the upper and lower components of the Short-Mayo Composite aircraft taken a few seconds after they separated during the first public demonstration at Rochester on 23rd February, 1938.

The lower part of the Short-Mayo Composite consists of a high wing cantilever monoplane, named "*Maia*," which closely resembles an Empire flying boat. It has a wing span of 114 ft. and is powered by four Bristol "Pegasus Xc" nine-cylinder radial engines, fitted with three-bladed controllable-pitch airscrews. The engines have a normal output of from 810 h.p. to 850 h.p. at 2,250 r.p.m. at a height of 4,000 ft., and a take-off output of from 920 h.p. to 960 h.p. at 2,475 r.p.m.

Although the "*Maia*" is primarily constructed for "assister" work, the interior of the hull has two decks of similar form to those of the Empire flying boats, and is provided with three passenger compartments, bunk stowage, pantry, luggage and stowage spaces, and is capable of carrying out flights of a similar kind to those of the Empire aircraft.

The upper component is a four-engined float seaplane named "*Mercury*." It also is a high wing cantilever monoplane, but naturally is of smaller and lighter construction. Its structure is all-metal, with the exception of the ailerons, which are covered with fabric, and the fuselage is built on a stout centre keelson. The wing span of "*Mercury*" is 73 ft., and its engines are of the Napier-Halford "Rapier" Mark V 16-cylinder "H" type, each capable of a maximum output of 340 h.p. and a normal output of 315 h.p.

The pilot of the "*Mercury*" is located in a compartment in front of the leading edge of the wings, a position giving excellent visibility, and immediately behind his seat is another for the radio operator. An ingenious feature of this part of the seaplane is the hinging of the nose of the fuselage to permit rapid inspection and adjustment of controls.

From the radio compartment a gangway runs aft beneath the main wing spar to the mail storage compartment, and the fuel tank of the seaplane is fitted in the spar itself. Its capacity is 1,200 gal. and it is interesting to note that of the 20,500 lb. that represent the total weight of the upper component of the Short-Mayo Composite, nearly one half is made up of fuel and oil.

The structure that unites the upper and lower components for the take-off consists of pylons of steel tube in the form of inverted "V's," about 7 ft. in height. These are fitted to the top of the hull of the lower component and joined by a cross beam, which forms the cradle for the reception of the central keelson of the fuselage of the seaplane. A hook on the cross-beam locks the two aircraft together, engaging with a latch on the release gear on the keel of the upper component. Three locks are fitted to this latch, which is the only positive link between the two craft.

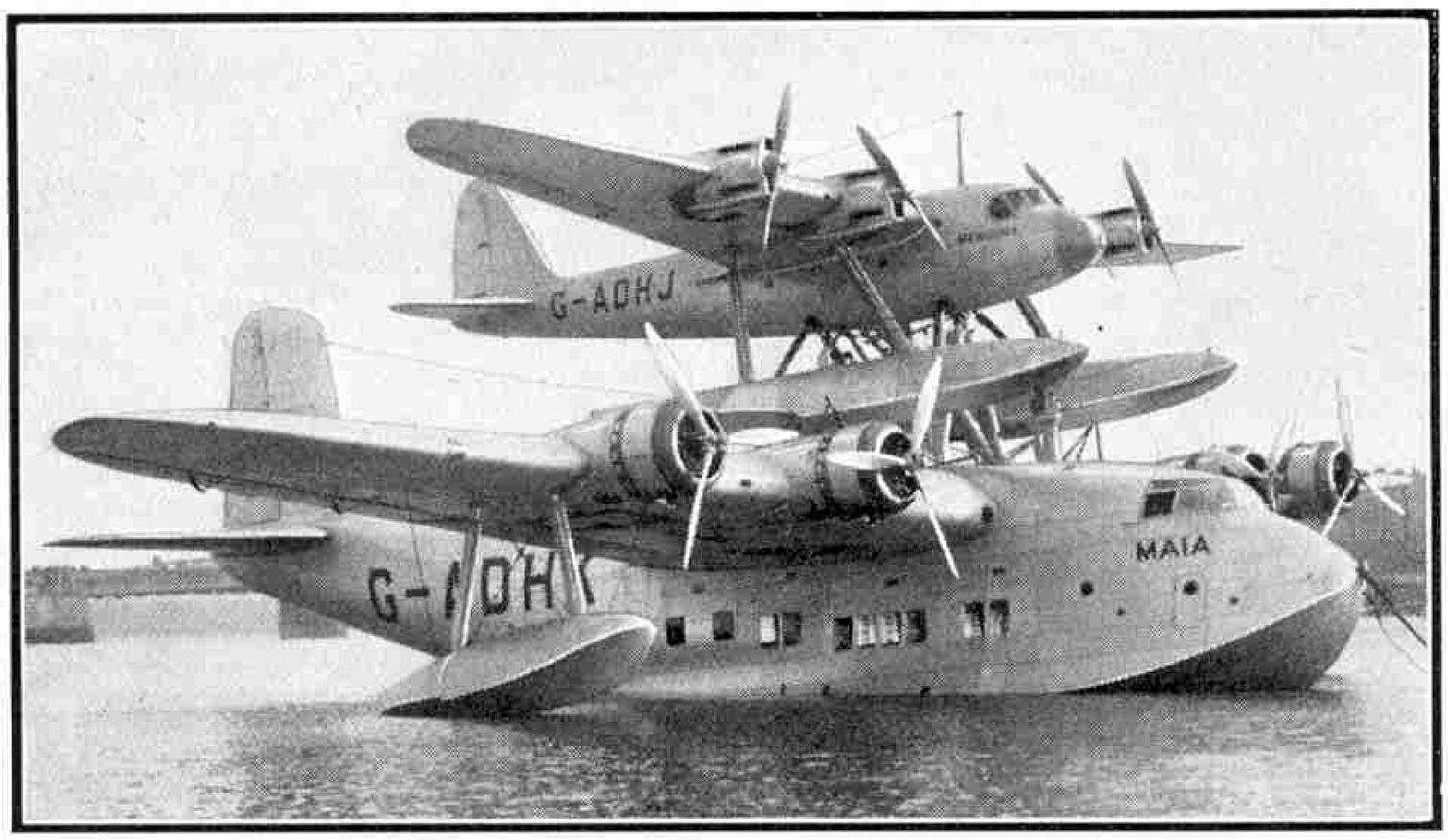
The seaplane is placed in position on the cradle of the flying boat by a small crane or gantry, and is then locked into position by the action of the latch. The two then take off on their combined flight, and climb to an altitude suitable for separation. The detachment of the two components is effected in three distinct stages, and it is for this purpose that three locks are fitted to the latch on the seaplane keel. One of the release controls is fitted in the flying boat, a second in the seaplane, and the third, which is the final release, is automatically operated after the other two have been tripped in turn.

When the two linked craft have attained the necessary height and are flying level, the differing wing structures of the two components set up aerodynamic forces tending to make the aircraft separate. Special instruments indicate

this tendency to the respective pilots, and when the time for detachment arrives, the pilot of the flying boat signals to the pilot of the seaplane his intention to release his section of the locking device. When this is done, the seaplane pilot in turn frees his portion of the composite locking mechanism after informing the flying boat pilot that he is about to do so.

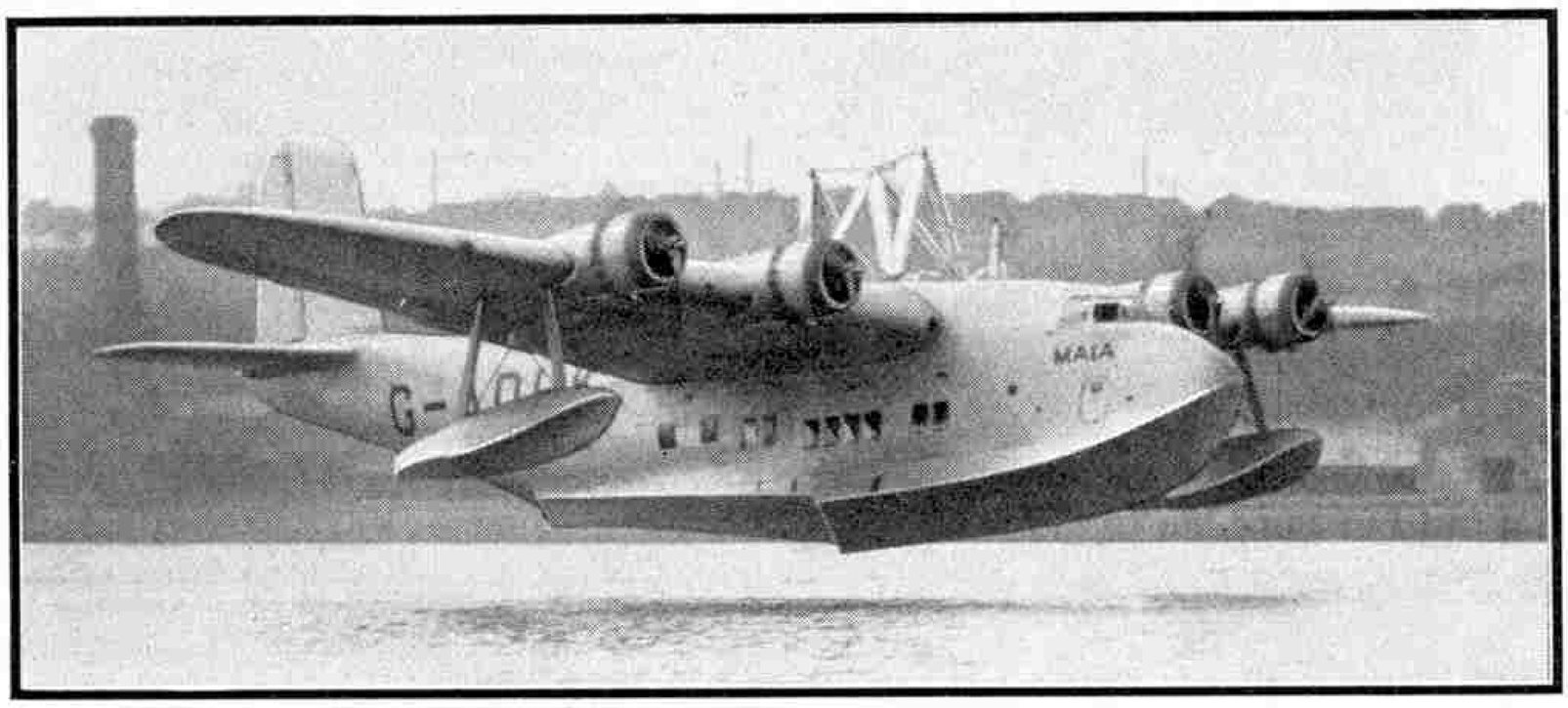
The release of these two locks prepares the way for the separation. It does not part the components, however, for the tripping of the actual release is effected by the aerodynamic forces acting upon the two aircraft, and normally occurs just after the second lock has been tripped by the seaplane pilot.

By arranging the separation of the two components in this way, the detachment can only take place through the combined action of both pilots, and when the aerodynamic conditions required to part the craft are in operation. If an attempt is made to release the latch at too low an airspeed, the components remain locked together until the predetermined force has been reached.



The Short-Mayo aircraft ready for a flight, with the two components locked together. It was built by Short Bros. (Rochester and Bedford) Ltd., to whom we are indebted for the illustrations on this page.

The separation of the two components takes place so evenly that the flying boat and seaplane can be said to float apart. The seaplane continues to climb, and the flying boat descends slightly, this relative movement ensuring that the two move clear of each other. After launching the seaplane, the pilot of the flying boat returns to his base. If necessary he can proceed with the launching of further seaplanes, or he can carry out some other flight in which his flying boat is used as a single aircraft.



"Maia," the flying boat that forms the lower component.

While the two components are joined together both are in charge of the flying boat pilot, and the controls of the upper component are locked. This system prevents misunderstandings between the two pilots, with consequent avoidance of the risks that might arise from lack of perfect co-operation. Each pilot is always in control of the engines of his own machine, but can communicate by telephone with the other pilot and arrange for proper relative settings.

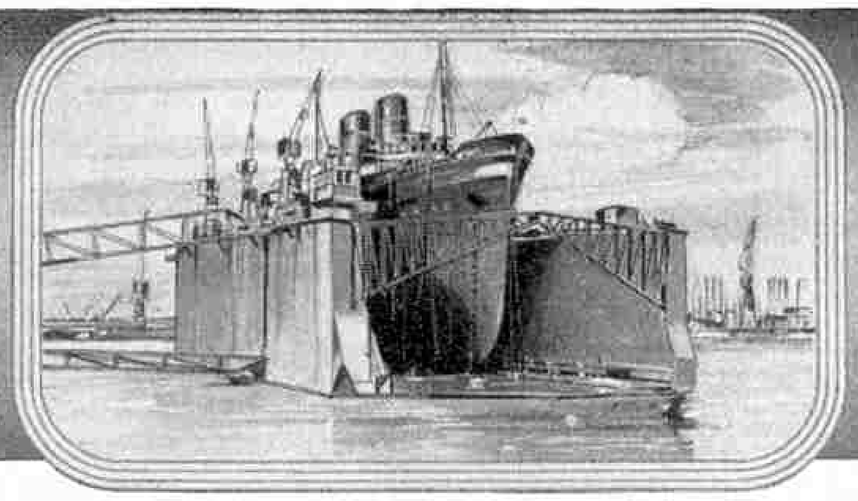
One advantage that is gained by the use of aircraft of the Short-Mayo Composite type is that it is possible to make a successful take-off from relatively small stretches of water, and in all normal conditions of sea and weather. This feature is likely to prove very valuable in the operation of long-range services. Another point is that if necessary the effective range and load-carrying capacity can be increased by delaying the separation of the components until they have made a combined flight of some considerable distance towards the destination of the seaplane.

If at any time it is found after taking-off that the separation of the two components must be abandoned, the combined aircraft can land safely as a single unit. If the seaplane has to make a forced landing after separation, the pilot can operate a jettison valve that will release enough fuel to lighten the craft and ensure a safe descent.

At the trials, which were held on the Medway, the Short-Mayo Composite gave an extremely good performance. After taking off smoothly and easily in a relatively short distance, the combined aircraft climbed rapidly, and showed remarkable steadiness and a most sensitive response to the controls. After a circular flight over the mouth of the Medway, the separation was carried out as the aircraft was approaching the take-off point, and the two components parted so smoothly that the exact instant of detachment was not at all obvious.

As soon as the separation was carried out, the ascent of the seaplane and the descent of the flying boat gave a very interesting demonstration of the effects of the differing wing designs of the two aircraft on their directions of flight. The upper and lower components moved sharply away on diverging paths and in a matter of a few seconds were completely clear of each other. The flying boat then circled and landed, while the seaplane gave an excellent exhibition of its speed and efficiency in a series of circular flights at both high and low altitudes. A perfect landing was made at the conclusion of these, and the small wash made by the floats was a noticeable point.

The range of the seaplane is approximately 3,750 miles, its cruising speed being about 180 m.p.h. This should allow a flight across the North Atlantic to be carried out successfully, even in the face of adverse headwinds. for the "assisted" take-off can be made with engines of only 1,260 h.p.



SHIPPING NEWS

Two British Cruisers Launched

The launch took place in March of H.M.S. *"Belfast"* at the Queen's Island Shipyard of Harland and Wolff Ltd. The naming ceremony was performed by Mrs. Neville Chamberlain, and the illustration on this page shows the hull gliding into the water.

H.M.S. *"Belfast"* is a cruiser of the improved "Southampton" class and was laid down under the 1936 Admiralty programme. Her length is 579 ft. with a beam of 63 ft. 4 in., and she has a standard displacement of 10,000 tons. Geared turbines developing 80,000 h.p. will be fitted, and will give her a speed of 32½ knots.

H.M.S. *"Edinburgh,"* a sister ship of the *"Belfast,"* is being constructed by Swan, Hunter and Wigham Richardson Ltd. at Wallsend-on-Tyne, and also was launched in March.

Rapid progress is being made in the strengthening of the British Navy, and vessels at present under construction amount to about 547,000 tons. The corresponding figure in January 1935 was 139,000. Some 60 new vessels of all classes are expected to be placed in service by March 1939, their total tonnage being over 130,000.

A Quaint Montreal Custom

The first ocean-going vessel to reach Montreal after the break up of the ice on the St. Lawrence River this year was the Canadian Pacific liner *"Duchess of Bedford,"* which arrived on 17th April after a voyage from Liverpool. In accordance with custom, Captain A. R. Meikle, commander of the vessel, was presented with a top hat and gold-mounted walking stick in recognition of the distinction.

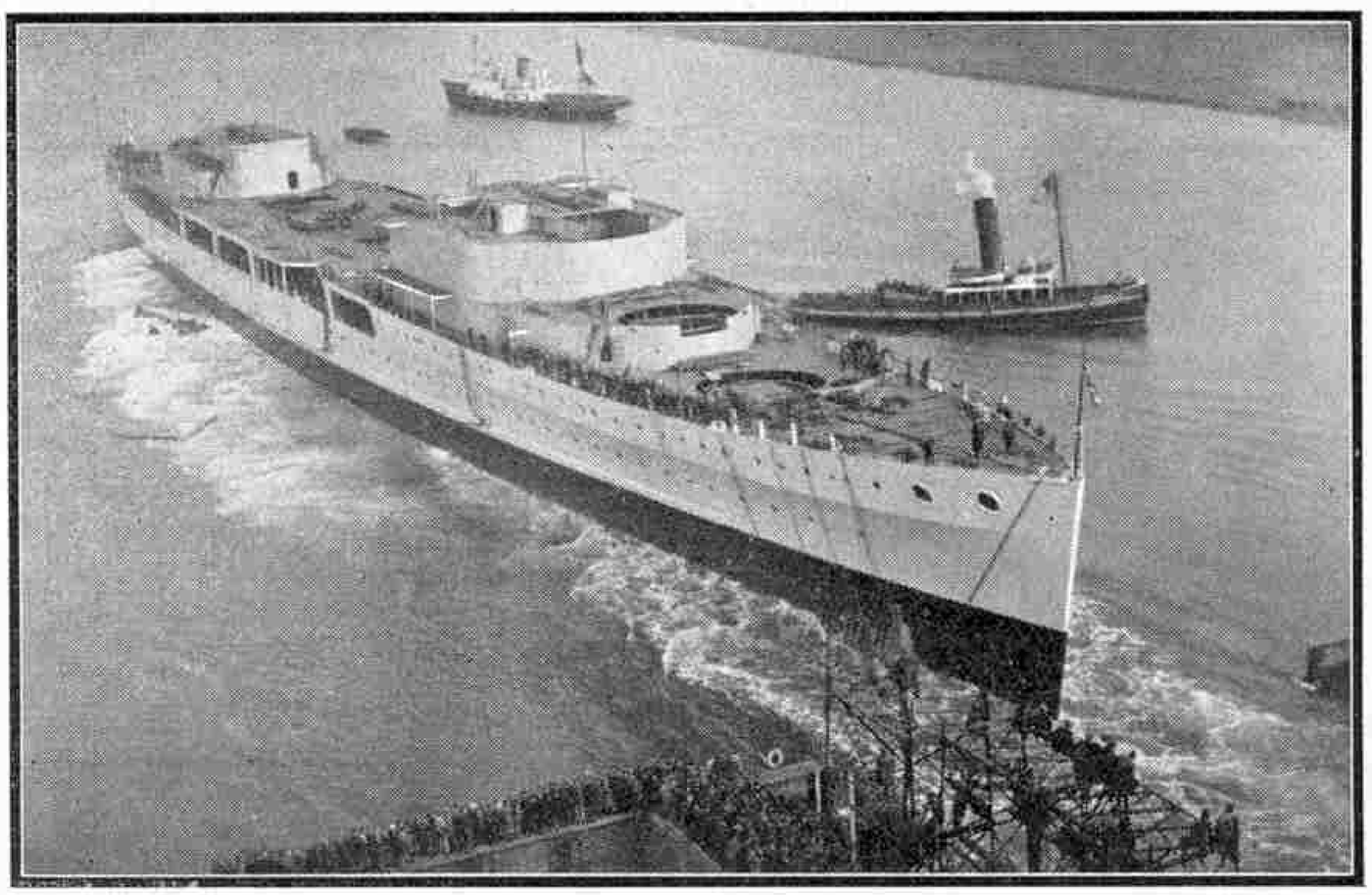
The Largest Dredger in the World

What is claimed to be the world's largest dredger was recently completed for the U.S. Army Corps of Engineers, New York, who will use her in the task of maintaining a clear channel into New York Harbour. She is named *"Goethals,"* and is 476 ft. long, with a displacement of 15,000 tons.

The dredging mechanism of the new vessel is of the suction type, and the material brought up by it is discharged into bins in the hull. A crew of 85 is carried, but another 15 can be accommodated. Turbo-electric propelling machinery is fitted and when fully loaded a speed of 11 knots can be attained, this being increased to 15½ knots when the vessel is empty.

A Thrilling Life-Boat Rescue

The Royal National Life-boat Institution has received a letter of thanks from La Société de Grande Pêche, of Boulogne, for the rescue by the Salcombe motor life-boat of 15 men from the trawler *"Tarascon"* during rough weather in March. The trawler ran on the rocks in the darkness, and her crew got ashore under the cliffs, where tremendous seas were breaking. The life-boat got as close to the shore as possible, fired a line to the men, and rescued them all, although she herself struck heavily on a rock.



The launch of H.M.S. "Belfast," the new cruiser built in the Belfast yards of Harland and Wolff Ltd., to whom we are indebted for our illustration. A description of the vessel is given on this page.

The new motor life-boat built for Whitby recently made the passage from Cowes to her station, a distance of 360 miles. She called at Ramsgate, Gorleston and Spurn Head on the way, and took about 2½ days for the voyage.

Whitby is one of the oldest life-boat stations. It was established in 1802, and has a record of nearly 600 lives rescued from shipwreck.

Giant Boilers for *"Queen Elizabeth"*

The 12 main boilers to be installed in *"Queen Elizabeth,"* the giant Cunard White Star liner under construction at Clydebank, are the largest ever designed for marine purposes. Several have already been completed by the builders, John Brown and Co. Ltd., and they are so enormous that part of the factory wall has had to be knocked down to allow them to be removed from the shop. As they are too large to be lifted into the ship complete, they will be dismantled and lowered into the boiler rooms in sections for reassembly.

Excellent progress is being made with preparations for the launch. The launching-ways are being built up, and several of the eight launching "triggers" are in position.

Life-Boat Display at Glasgow Exhibition

The principal exhibit in the pavilion of the Royal National Life-boat Institution at the Empire Exhibition, Glasgow, is a new motor life-boat built for the station to be established at Tobermory. The boat is of the cabin type named after the late Mr. G. L. Watson, of Glasgow, who was the Institution's consulting naval architect from 1887 until 1904. She is 46 ft. in length, and in service weighs 21 tons, with crew and gear on board. There are seven water-tight compartments and 142 air-cases, and twin screws driven by two 40 h.p. Diesel engines are fitted.

The engine-room is a water-tight compartment, and each engine is itself water-tight, so that the boat could continue running even if the engine-room were flooded. The boat has a speed of 8 knots, and carries sufficient fuel to be able to travel 196 miles. The crew number eight, and in rough weather 95 people can be taken on board. A line-throwing gun and an electric search-light are installed, and electric lighting and radio telephony are other features of the craft. The boat cost about £8,000, and will be named *"Sir Arthur Rose."*

Other features of the display are a series of models showing the development of the life-boat from the *"Original,"* an open rowing boat built at South Shields in 1789, and photographs showing life-boats in action.

"Ark Royal" Trials

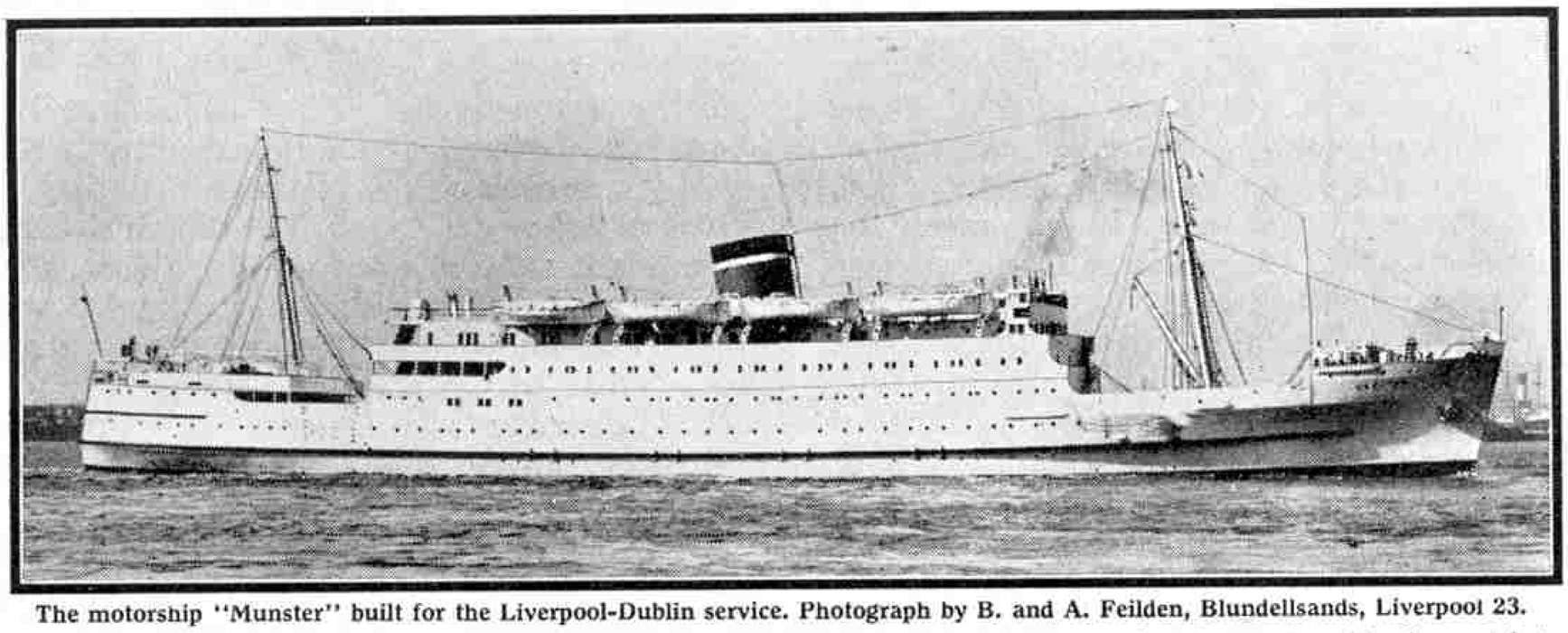
The main fitting-out work on the new aircraft carrier *"Ark Royal"* was completed in April, and on the last day of the month she left the Birkenhead shipyards of her builders, Cammell Laird and Co. Ltd. The grey giant, with her single funnel and mast perched amidships on the port side of the vast open deck, was towed down the River Mersey by two powerful tugs, with two others in attendance, to the Gladstone Dock of the Liverpool Dock Board, where she was dry-docked to have the underwater part of her hull painted, and the fitting of her three propellers completed.

After some two weeks in dock the *"Ark Royal"* left for her trials. Anchor trials were conducted on the Mersey, and speed trials are taking place on the Clyde. Eventually she will return to Birkenhead for the fitting of her final equipment, prior to being handed over about the end of July. She is the first British naval vessel to be specially built to carry aircraft.

New Ship for Liverpool-Dublin Service

The upper illustration on this page shows the new cross-channel motorship *"Munster,"* built at Belfast by Harland and Wolff Ltd. for the British and Irish Steam Packet Co. Ltd. She is a sister ship to the *"Leinster,"* which was described and illustrated in the *"M.M."* for February 1938, and is similar to that vessel in all respects, having a length of 367 ft. and a gross tonnage of 4,320. Accommodation is provided for over 500 passengers.

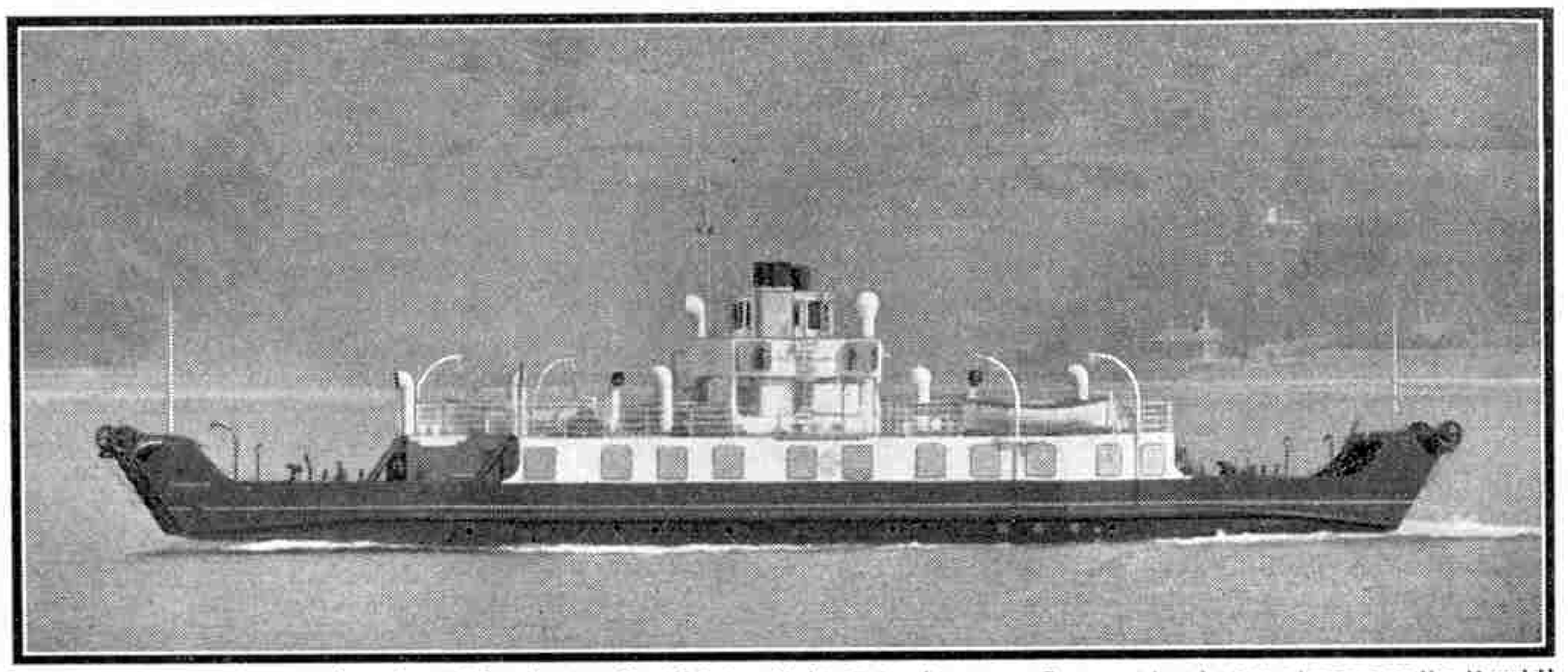
Both vessels were built for the Liverpool-Dublin overnight service, leaving port soon after 10 p.m. and completing the crossing by about 8 a.m., but the *"Leinster"* on her completion in November was temporarily placed in the company's Liverpool-Belfast service, her funnel being coloured in the appropriate red, blue and black. When the *"Munster"* was handed over recently, both vessels were placed on the Dublin service, their funnels being painted green with a band of white and one of black at the top. The colour scheme of the two vessels is both striking and attractive, for the hull is light buff and the superstructure white.



The motorship "Munster" built for the Liverpool-Dublin service. Photograph by B. and A. Feilden, Blundellsands, Liverpool 23.

Peninsular and Oriental Line News

The twin-screw turbine steamship *"Strathallan"* recently completed successful trials and left London on her maiden voyage. She is a sister ship to the *"Stratheden,"* completed last December, and both vessels were built by Vickers-Armstrongs Ltd., of Barrow-in-Furness, for the Peninsular and Oriental Steam Navigation Company. They have a length of 664 ft. 6 in. and a gross tonnage of about 23,400. Their 24,000 s.h.p. engines give a speed of 21 knots.



The Diesel-engined motor ferry boat "Lymington," which has Voith-Schneider propellers and has become known as the "crab" ship because of its ability to move sideways. Photograph by courtesy of Wm. Denny and Bros. Ltd., Dumbarton, her builders.

The two vessels are for the P. and O. service between England and Australia, by way of Bombay, and the *"Strathallan's"* maiden voyage was over this route. She will return to England in time for the cruising season, during which she will make four cruises, one to the Baltic, and three to the Mediterranean, including visits to the Black Sea, Athens and the Adriatic. She will resume normal service in September.

The P. and O. liners *"Kaisar-I-Hind,"* of 11,518 tons, and *"Moldavia,"* of 16,000 tons, are to be broken up. The former was built at Greenock in 1914, and the *"Moldavia"* at Birkenhead 16 years ago.

New Danish Train Ferry

A train ferry recently ordered for the Korsor-Nyborg service across the Great Belt between the islands of Funen and Zealand, Denmark, is stated to be the largest ever projected in Europe. Its length will be about 340 ft., and two six-cylinder oil engines developing 5,650 i.h.p. will give her a service speed of over 15 knots. The maximum speed will be 16¼ knots.

The new vessel is the fifth recently ordered for the service.

Water Coach to Ply on the Thames

The *"Pride of Westminster,"* London's first water coach, was launched in April by Saunders Shipyard Ltd., East Cowes, her builders. She will run between Westminster Bridge and Southend-on-Sea, taking about 2½ hours for the trip, and two round journeys will be made daily.

This vessel has a length of 70 ft. and a beam of 16 ft. Her hull is built of English elm and American rock elm, with steel reinforcing, and she is equipped with two A.E.C. standard six-cylinder marine oil engines, each developing 100 h.p. Electric light is fitted throughout, together with an electrically-operated searchlight and siren.

She will be able to carry 100 passengers in two saloons, very comfortably appointed. Wide windows will allow passengers to obtain a clear view of the docks and shipping. A promenade deck aft will be used when weather conditions permit.

* * * *

A ship driven by a gas engine has been built in Germany. The engine is of 265 h.p., and the gas used in it is supplied by a producer burning coke or anthracite, fed by a bucket elevator.

The Southern Railway's "Crab" Ship

One of the most interesting vessels recently put into service is the Diesel-engined ferry boat *"Lymington,"* built by William Denny and Bros. Ltd., Dumbarton, for the Southern Railway. The outstanding feature of this vessel is that she is fitted with Voith-Schneider propellers. These are of a novel design and enable her to be manœuvred in any direction, sideways as well as ahead or aft, without the use of a rudder. For this reason she has become known as the "crab" ship.

The *"Lymington"* has two Voith-Schneider propellers, one at the bow and the other at the stern. Each consists of five vertical blades fitted round the circumference of a circle, and the rotation of the whole unit propels the vessel, the direction of movement depending on the relative positions of the blades, which themselves can be turned to any required angle. These positions are controlled from the bridge, where there is also a lever that enables the propellers to be linked to give a lateral movement. Ability to move sideways is a great advantage in view of the restricted space in which the vessel is at times called upon to operate, and of course obviates the need for steering gear and rudder.

The vessel has a length of 148 ft. with a breadth of 36 ft. 8 in. The propelling machinery consists of two sets of Diesel engines, each of 200 b.h.p., which drive the propellers at 230 r.p.m., giving a speed of 11 knots.

The vessel carries passengers, motor cars and cattle between Lymington, Hampshire, and the Isle of Wight. Her main deck has space for 16 to 20 motor cars, which are embarked and disembarked by means of two electrically-controlled gangways, one at each end of the ship. The gangways actually form part of the bow and stern of the vessel, as will be seen in the lower illustration on this page. The *"Lymington"* can carry 450 passengers.

The *"Mauretania's"* Home Port

The new 33,000-ton Cunard White Star liner *"Mauretania,"* now building at Birkenhead, will on her completion next year displace the 27,750-ton liner *"Georgic"* as the largest liner to use the Thames. On her entry in the Atlantic service she will sail from the King George V Dock.

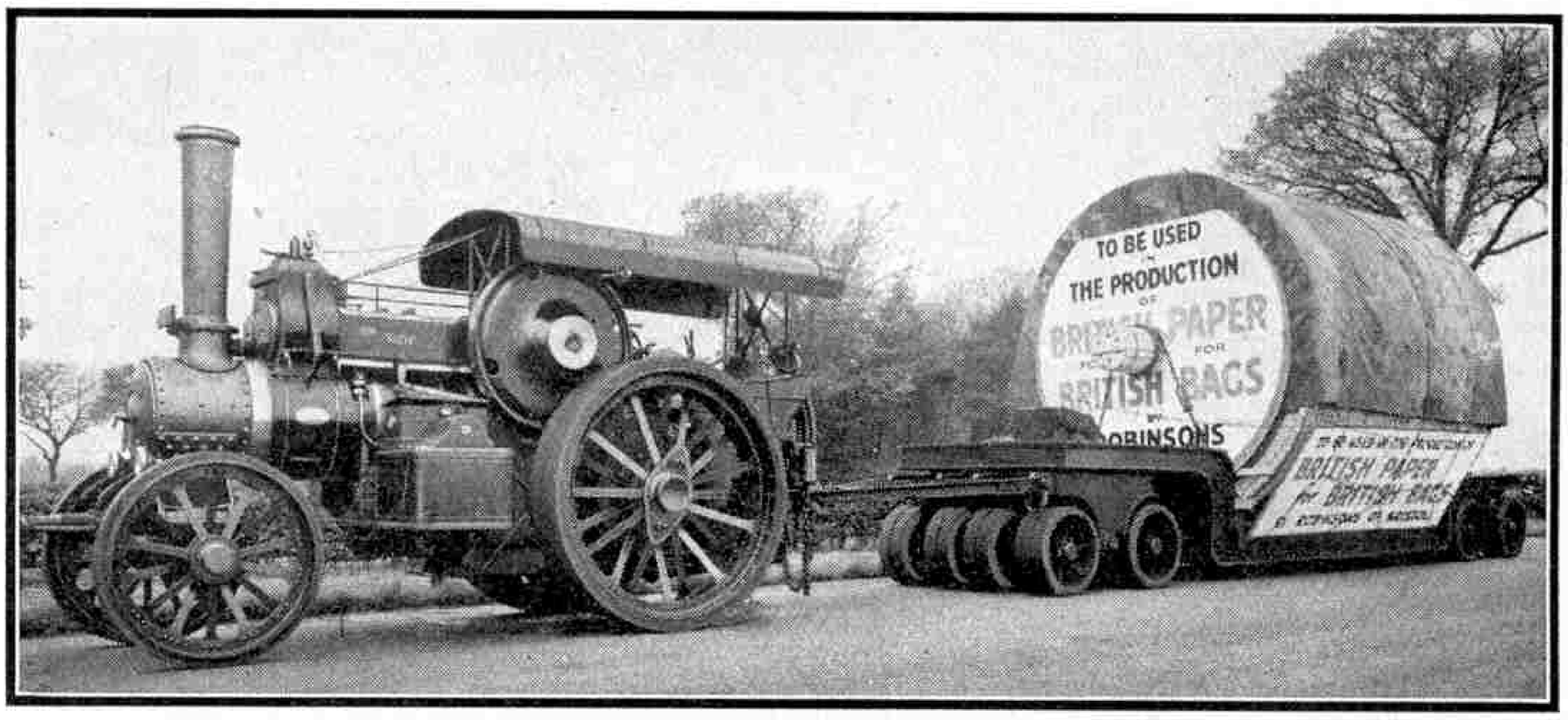
Transport Unlimited

Special Methods for Moving Giant Loads

By T. Holloway

INDUSTRY to-day has at its beck and call every conceivable aid that science and ingenuity can devise. The day is past when the producer had of necessity to solve his own particular problems or, as was often the case, to leave them unsolved. Thanks to modern developments and co-operation between producers and scientific specialists, industry has forged ahead in a truly amazing manner.

Undoubtedly one of the most outstanding instances of this progress is the great stride forward made in recent years in road transport. By reason of this great advance, road transport in its turn has been able to render immeasurable aid to other branches of industry, and wonderful achievements have been accomplished by firms who specialise in the carrying of "out-size" loads.



A 75-ton cylinder for use in the production of paper bags during its journey by road from Avonmouth to Bristol. It had previously been brought from Manchester by water.

Not many years ago we used to regard with awe and wonder the horse-drawn timber wagons that rumbled noisily along our highways. To-day we regard with similar feelings loads of anything up to 150 tons as they are borne slowly but surely to their destinations. The transport of these "abnormal indivisible loads," as they are called, is now a science, and it is not a difficult matter to see what a boon this comparatively recent development is proving. For instance if a great Atlantic liner needs a new propeller or a power house a giant transformer, it is no longer necessary for the manufacturers to transfer their staff and equipment to the spot in order to re-erect their products from many small sections. Instead the articles in question can be erected economically and conveniently in their own shops and then transported in the completed state to their destinations, a much more satisfactory method for all concerned.

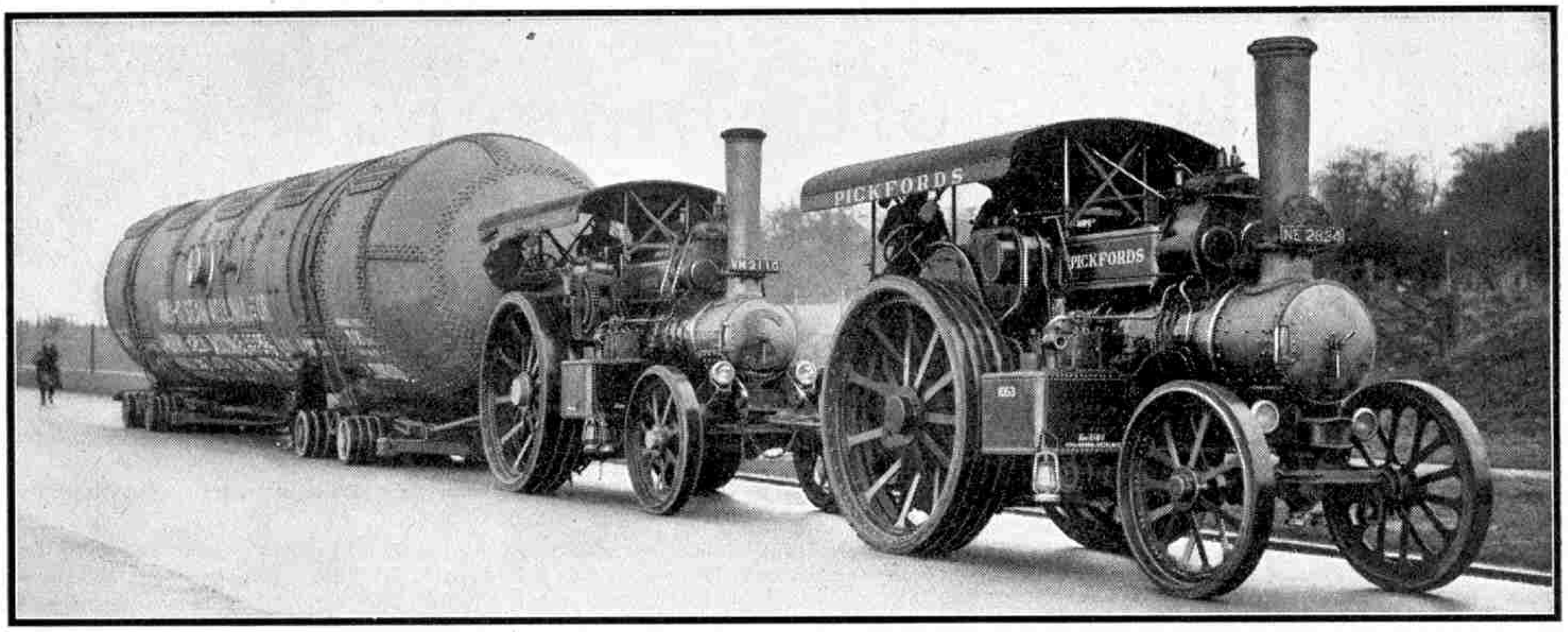
An abnormal indivisible load is not necessarily one of excessive weight. Loads of perhaps no more than 20 tons often call for the services of specialised transport by reason of their unwieldy dimensions. This type of work is undertaken as far as possible during the night, when the minimum of traffic is on the move. For instance, Pickfords Ltd., the heavy haulage specialists, experienced no small difficulty in transporting a section of a wind tunnel used for experimental purposes from the manufacturer's works to the factory of the Bristol Aeroplane Co. Ltd. The task was made extremely complicated by the numerous overhead tramway wires and other similar obstructions in Bristol's thoroughfares. The difficulties were successfully surmounted by proceeding with the task before the city's traffic commenced, however, and by working in close co-operation with police and road patrols.

A great deal of preliminary work has to be done before the transport of any "outsize" load is undertaken. First of all every mile of the proposed route has to be carefully surveyed in order to make certain that there are no bridges of insufficient strength to carry the excessive strain, and weak bridges have to be shored up when no alternative route is available. If the load is of extraordinary length each bend and deviation of the road has to be measured to ensure that it can be negotiated, and if the object to be transported is of unusual height the clearance of every bridge on the route must be tested. Sometimes it has even been found necessary to lower the surfaces of roads passing under bridges to allow the passage of the more bulky freights.

Every highway authority and County Council must be given two days clear notice of any "outsize" load passing through the districts they control, and if any vehicle exceeds 8 ft. in width the police also have to be notified. In the event of damage to roads or bridges the authorities concerned can claim compensation from the transport company.

Early this year Pickfords Ltd. transported what is claimed to be the world's largest indivisible load from Annan, Scotland, to the Beckton Gas Works, Essex, of the Gas Light and Coke Co., a journey of 325 miles. The load consisted of a giant steam accumulator, 70 ft. in length and 12 ft. in diameter, that weighed over 90 tons! Preparations for this undertaking began as far back as 1936. Every mile of the proposed route was surveyed twice, the last survey being carried out shortly before the actual journey commenced in order to ensure that no last-minute obstruction of any type had appeared at any point along the route.

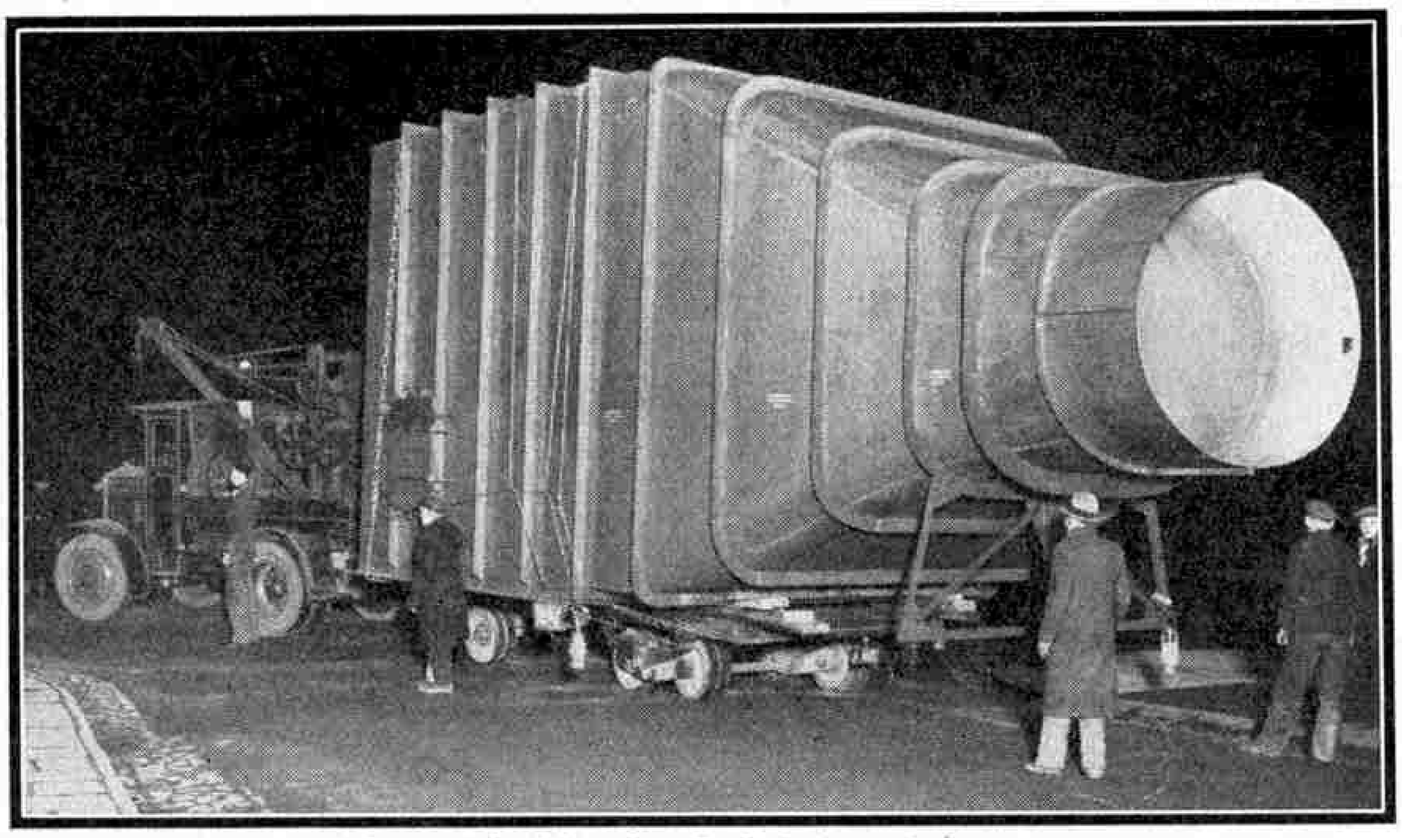
Police and highway authorities were duly notified and



The world's largest indivisible load. This giant steam accumulator is 70 ft. long and 12 ft. in diameter, and weighs over 90 tons. It was hauled on a 32-wheeled trailer from Annan, in Scotland, to Beckton Gas Works, Essex, completing the journey of 325 miles in 21 days.

every tiny detail carefully planned. When the stage was set three Fowler traction engines set out for Scotland to collect the load, but Nature frustrated all the elaborate planning by sending a severe blizzard in the mountainous regions of Shap. The second attempt brought success, however. On 6th January the hazardous journey from Annan began, at an average speed of 2 m.p.h., and it took the tractors 21 days to reach their destination. The treacherous regions of Shap again were a source of inconvenience, and three days were lost owing to heavy snow, so that the actual travelling days numbered 18. Each traction engine used 1,000 gallons of water daily and required about 6½ tons of coal for the whole journey. Progress through the Metropolitan Police area was much speedier than during the rest of the journey, owing largely to splendid co-operation on the part of the police authorities.

The vehicle on which the colossal load was conveyed cost more than £3,000. It was constructed by Cranes (Dereham) Ltd., and comprises two 16-wheeled bogies, making 32 solid-tyred wheels. The total weight of the trailer is 30 tons.

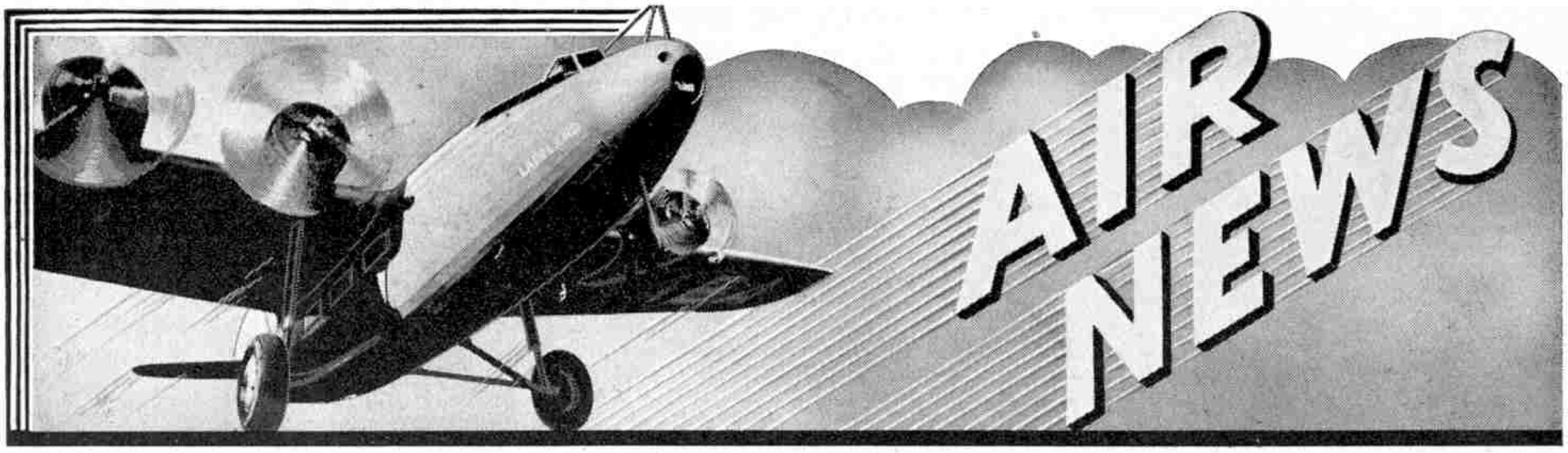


A section of a wind tunnel for the Bristol Aeroplane Co. Ltd. that made an extremely awkward load. It was taken through the city by night in order to avoid disturbance to other traffic.

Pickfords Ltd. have a wide range of specially constructed units for dealing with the heavy transport section of their work. These include a fleet of the famous Scammell vehicles, designed to carry loads of from 25 to 150 tons. Their largest trailer is a 32-wheeler, each of its two bogies having 16 wheels. These bogies can be used separately or as one unit, and it will be appreciated that the two units can be employed when the load is of excessive length.

It is sometimes necessary to convey loads to points off the beaten track and over soft ground. In these instances tractors with creeper tracks or rail bogies operating on specially laid metals are used. At first thought it would seem that rail transport is the best medium for dealing with super loads. Only a minority of firms have their premises flanking the railway, however, and are thus able to load at their own doors. In the case of firms whose works are some distance from the line it would not be an economical move to charter a special vehicle only to convey the load to the nearest railway depot. It is generally far more convenient to engage a firm of road-transport specialists, but there are instances where loads have to be transported partly by road and partly by rail.

Not long ago a 75-ton cylinder for use in the production of paper bags presented its makers with a serious transport problem. Its diameter was 15 ft., and because of its size it was found impossible to convey it entirely by road from the maker's works at Bury to its destination at Bristol. The problem was eventually solved by conveying it from Bury to Manchester docks and shipping it aboard a special boat equipped with its own lifting tackle. If such a boat had not been available it is extremely difficult to surmise what further complications would have arisen, for at that time the docks at Avonmouth were not equipped with a crane large enough to deal with such an unwieldly burden. The journey from Avonmouth to Bristol was completed by road, and the illustration on the opposite page shows the giant cylinder on the 16-wheeled trailer used for this purpose, with the powerful traction engine that hauled the immense load to its destination.



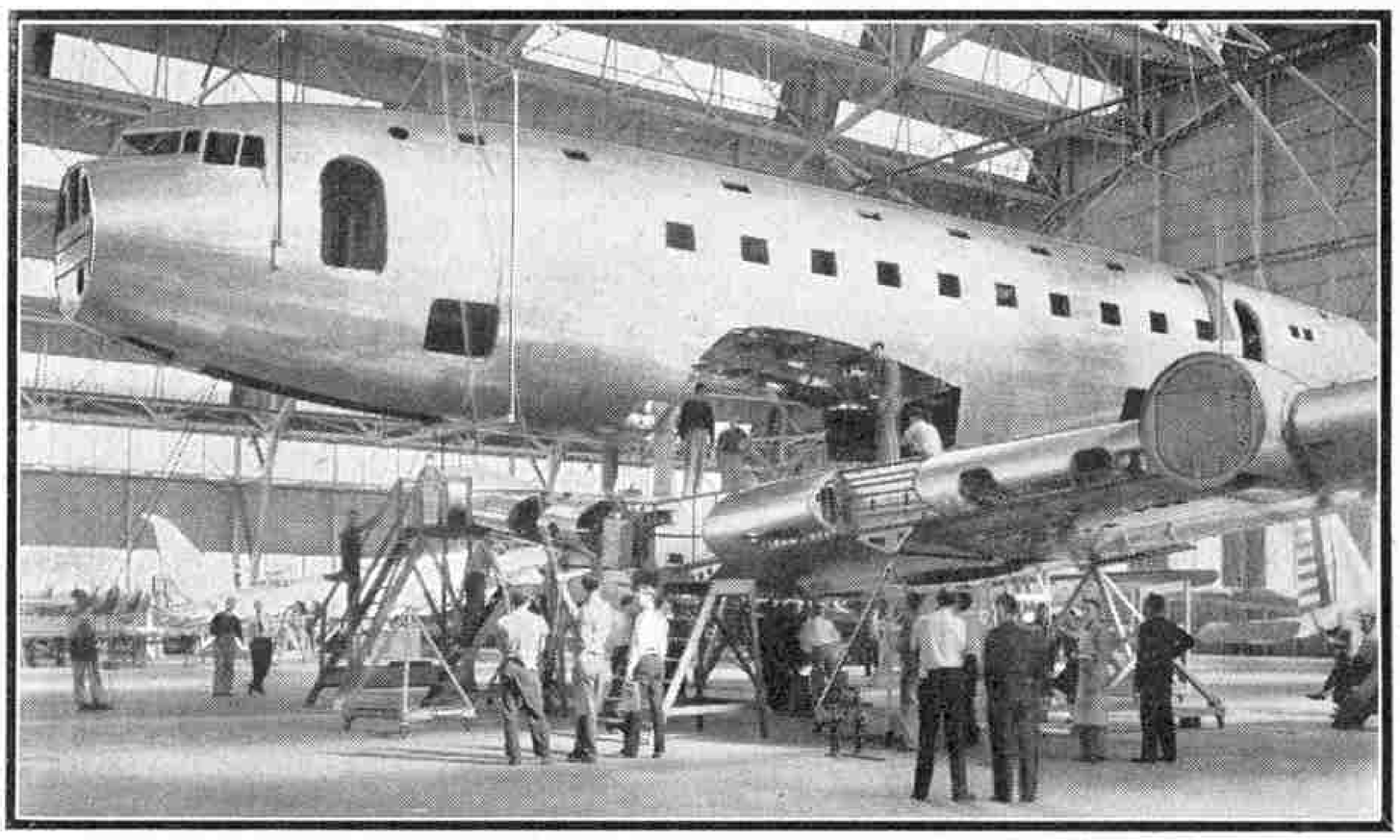
The Largest United States Air Liner

The illustration on this page shows the first Douglas DC-4 air liner under construction, and gives some idea of its great size. When completed this low wing monoplane will have a wing span of 138 ft. 3 in., and will be 97 ft. long and 24 ft. high. It is being built to the joint order of the five largest air transport firms in the United States, and the Douglas Company claim that it will be the largest and finest air liner in that country.

At first the DC-4 will be fitted with four Pratt and Whitney "Twin-Hornet" engines. These will develop a total of 5,600 h.p., which is 1,000 h.p. more than is required by most of America's finest streamlined locomotives to draw a heavy train on record-breaking runs. It is anticipated that they will enable the liner to attain a top speed of about 237 m.p.h., and to climb to a height of 24,000 ft. At cruising speed the aircraft will have a range of 2,200 miles.

The massive fuselage will be luxuriously equipped to carry 42 passengers, in addition to a crew of five and 6,500 lb. of mail and freight. The gross weight will be just over 29 tons, or almost three times that of the Douglas DC-3. It will have a three-wheel undercarriage.

A full description of the Douglas DC-4 will be published in the *"M.M."* as soon as details are available.



Assembling the largest United States air liner. The centre section of the 138 ft. 3 in. wing of the Douglas DC-4 about to be fitted into the massive fuselage. Photograph by courtesy of Douglas Aircraft Co. Inc., U.S.A.

Vancouver to Have Great Pacific Coast Airport

Vancouver, the fine seaport on the Pacific coast of Canada, already has a sea-island aerodrome, and plans are now being made for a great marine air base as part of a scheme for the development of a long-distance ocean air service to connect Canada with Australia. Plans are now being made for the dredging of the seaplane harbour and the provision of hangars large enough to accommodate ocean-going flying boats. When the new air base is completed it will provide a valuable connecting link between the trans-Canada landplane route now being organised and a Pacific flying boat service.

London to the Arctic Circle by Air

The summer timetables of European air companies show that many interesting long-distance flights can be made across Europe by inter-connected routes. For instance it is possible to fly from London to Petsamo, in Finland, which lies within the Arctic Circle. Leaving London by a morning service and flying by way of Stockholm and Helsingfors, Petsamo is reached by the evening of the following day. Another striking example of a similar kind is the "Midnight Sun" air line, which during the summer season flies up the coast of Norway between Bergen and Tromso, and enables tourists to obtain superb bird's eye views of mountain peaks and fjords. Norway is now linked with the general European system by services that operate to Oslo by way of Copenhagen.

The scope for combined air and land trips has been increased. In these the tourist flies to the Continent and then makes excursions by motor coach and river craft, afterward returning to England by air, and this form of holiday is expected to be more popular this summer than ever before. Tourists to Germany can fly to Berlin, and then make a series of motor coach trips finishing at Cologne, where they board an air liner for England.

* * * *

Pan American Airways have introduced a weekly air service between Rio de Janeiro and Buenos Aires. Douglas DC-3s are being used, and both air mail and passengers are carried.

Broadbent Regains Australia-England Solo Record

Mr. F. Broadbent's attempt in March last to beat the England–Australia solo record held by Miss Jean Batten failed owing to a mishap to his machine when he landed on Flores Island, in the Malay Archipelago. He was more fortunate on his return flight in April, however, and had the satisfaction of regaining the solo record for an Australia–England flight, which had been won from him by Miss Jean Batten in October last year. Broadbent covered the 9,612 miles from Port Darwin to Lympne in 5 days 4 hrs. 21 min., which was 13 hours 54 min. less than the time taken by Miss Jean Batten. His best previous time for the trip was 6 days 8 hrs. 25 min., and was achieved in May 1937.

On his latest flight to Australia and back Broadbent flew a Percival "Vega Gull" fitted with a D.H. "Gipsy Six" engine. The return trip was generally uneventful and was made at an average cruising speed of about 140 m.p.h. No severe schedule was followed, nor was there any dramatic day and night flying at top speed, the only flying done during the night being over the 1,650 miles between Jodhpur and Basra. The longest halts were 9 hrs. at Singapore, 12 hrs. at Calcutta, and six hrs. at Jodhpur and at Nicosia, in Cyprus. The weather generally was fairly good, although a strong headwind and a dust storm were encountered during the night flight to Basra, and Broadbent's arrival at Rome after a 1,220 miles "hop" from Nicosia coincided with a terrific thunderstorm over the Italian capital.

It is interesting to note that the Australia-England air record has been broken and rebroken 10 times during the past seven years, and in every instance the aircraft employed has been fitted with D.H. "Gipsy" engines.

The D.H.95 All-Metal Monoplane

The de Havilland Aircraft Co. Ltd. are busy on the production of a new twin-engined transport aircraft. It will be an all-metal high wing monoplane, and will seat from 12 to 18 passengers.

Lockheed Monoplanes

Lockheed air liners are in regular use on air services in many parts of the world, and the makers, Lockheed Aircraft Corporation, of Burbank, California, are working day and night to fulfil the many orders in hand. Lockheed "Electras" are being supplied to air transport companies in Rumania, Yugoslavia, Argentina, and Venezuela. British Airways Ltd. have a fleet of "Electras," and an illustrated description of them was published in the *"M.M."* of August 1937. This company recently ordered four Lockheed 14s, or "Super Electras," and the first of these is expected to be ready for service in August next. They will be used on the recently surveyed air route to West Africa.

The Lockheed 14 is a larger monoplane than the "Electra." It seats 12 people, and has a speed of 250 m.p.h. Five of these aircraft have been ordered by Royal Netherlands Indies Airways, of Batavia, for services in the Dutch East Indies, and extensions to Manila and Australia, and 16 are being supplied to Trans-Canada Airlines, of Montreal, six of which will be employed on the company's Vancouver–Winnipeg service. The Polish air company known in England as L.O.T. have ordered a fleet of Lockheed 14s, and the United States company, Northwest Airlines, are adding three more aircraft of this type to their fleet.

Faster Empire Services

The high efficiency of the Empire flying boats has enabled Imperial Airways to speed up their Empire air services without resorting to night flying. Karachi, in India, is now brought within 2 days 9 hrs. of London, and the air journey to Calcutta takes only 3 days 6 hrs. On the England–Australia air route Singapore is reached in 5 days 2 hrs., as compared with 7 days before the revision, and Brisbane in 8 days 23 hrs., instead of 11 days. On the England–South Africa route, it now takes only 4 days 10 hrs., instead of 6½ days, to fly to Durban.

This speeding-up has benefited the transport of mails from Canada, which at present are brought by sea to Southampton. Mails from Montreal now reach Durban, nearly 10,000 miles away, in 9½ days, and Brisbane, 15,000 miles from Montreal, within a fortnight.

Imperial Airways services connecting with the Empire air routes also have been accelerated and Hong-Kong is now reached from London in 5 days 6 hrs.

British Air Mail Record

An American aeronautical magazine, *"American Aviation,"* recently referred to the remarkable success of the British Empire "first-class mail by air" scheme. It mentioned that during the six weeks preceding last Christmas 55 tons of air mail were despatched from Croydon to Africa alone, more than half the total air mail sent from the United States in a year.

The Koolhoven FK 46 two-seater Trainer, shown above, is the standard training machine of the Netherlands National Flying Schools. Photograph by courtesy of N.V. Koolhoven Vliegtuigen, Rotterdam.

Stainless Steel Aircraft

Duralumin and other aluminium alloys are now used extensively in the construction of metal aeroplanes and flying boats, but eventually they may be superseded by stainless steel, particularly in aircraft intended for operation over ocean routes, for stainless steel is non-corrosive. This alloy also has other important advantages. In America recently comparative tests were commenced of aeroplane wings made of stainless steel and aluminium alloy

Going aboard the seaplane "Mercury," the upper component of the Short-Mayo Composite Aircraft described in a special article on page 320. Photograph by courtesy of "Flight."

respectively. The stainless steel wing is a few pounds lighter than the duralumin one, but it is claimed that it has four times the rigidity and can withstand very much greater stress before collapsing when subject to vibration. It is stated that an aeroplane built of stainless steel would cost no more than one of aluminium alloy.

Isle of Man Air Races

The 1938 Isle of Man Air Races will be held on the 4th and 6th of this month. As usual the first day will be devoted to a race from London to the Island, but this time competitors will take off from Hatfield aerodrome instead of from Hanworth. They will fly to Speke Airport, Liverpool, where they will be required to halt for an hour before continuing to the next control point, Stanley Park, Blackpool. From Blackpool they will fly to the third control point, St. Bees Head Lighthouse, and from there they will enter the last lap of the race, a cross-channel flight to Ronaldsway aerodrome on the Island. Between 2 p.m. and 5 p.m. the sea portion of this lap will be patrolled by surface craft on the lookout for any competitors unfortunate enough to come down on the water.

The race will be a handicap one and open to all types of aeroplanes of any nationality, provided they have a minimum speed of 100 m.p.h. The winner of the race will be awarded a prize of £125 and a challenge cup presented by Germ Lubricants Ltd., and there will also be second and third prizes of £75 and £50 respectively.

On 6th June the Manx Air Derby, for aircraft with engines totalling more than 120 h.p., and the Tynwald Air Race, for lower-powered aircraft will be held. Both races will consist of three left-hand circuits of the Island, and will start and finish at Ronaldsway aerodrome. The winner of the Manx Air Derby will receive £100 and a challenge trophy, and the second and third will receive prizes of £50 and £20 respectively. In the case of the Tynwald Air Race the corresponding awards will be £50, £20, and £10.

New Civil Airports at Belfast and Basra

Two new commercial airports have been officially opened recently, one at Belfast in Northern Ireland, and the other at Basra in Iraq. The Belfast airport is owned by the Belfast Harbour Commissioners and has been established upon reclaimed land. Runways from 800 to 900 yds. long enable aircraft to take off in any direction, and there is a runway 1,400 yds. long for landings in bad weather. Floodlight and boundary light equipment have been installed.

At present there are only temporary buildings at the airport, but the construction of permanent ones is to be put in hand immediately, and when they are ready radio direction-finding and blind approach equipment will be installed in the control building. These buildings will be on the Musgrave Channel side of the airport, and will serve also for dealing with flying boat traffic.

The Basra airport is owned by the Government of Iraq. The runways are about 1,200 yds. long and have been laid in four directions. The airport also has facilities for flying boats.

A Footplate Trip Over the Rockies

Splendid Work on the C.P.R. *"Dominion"*

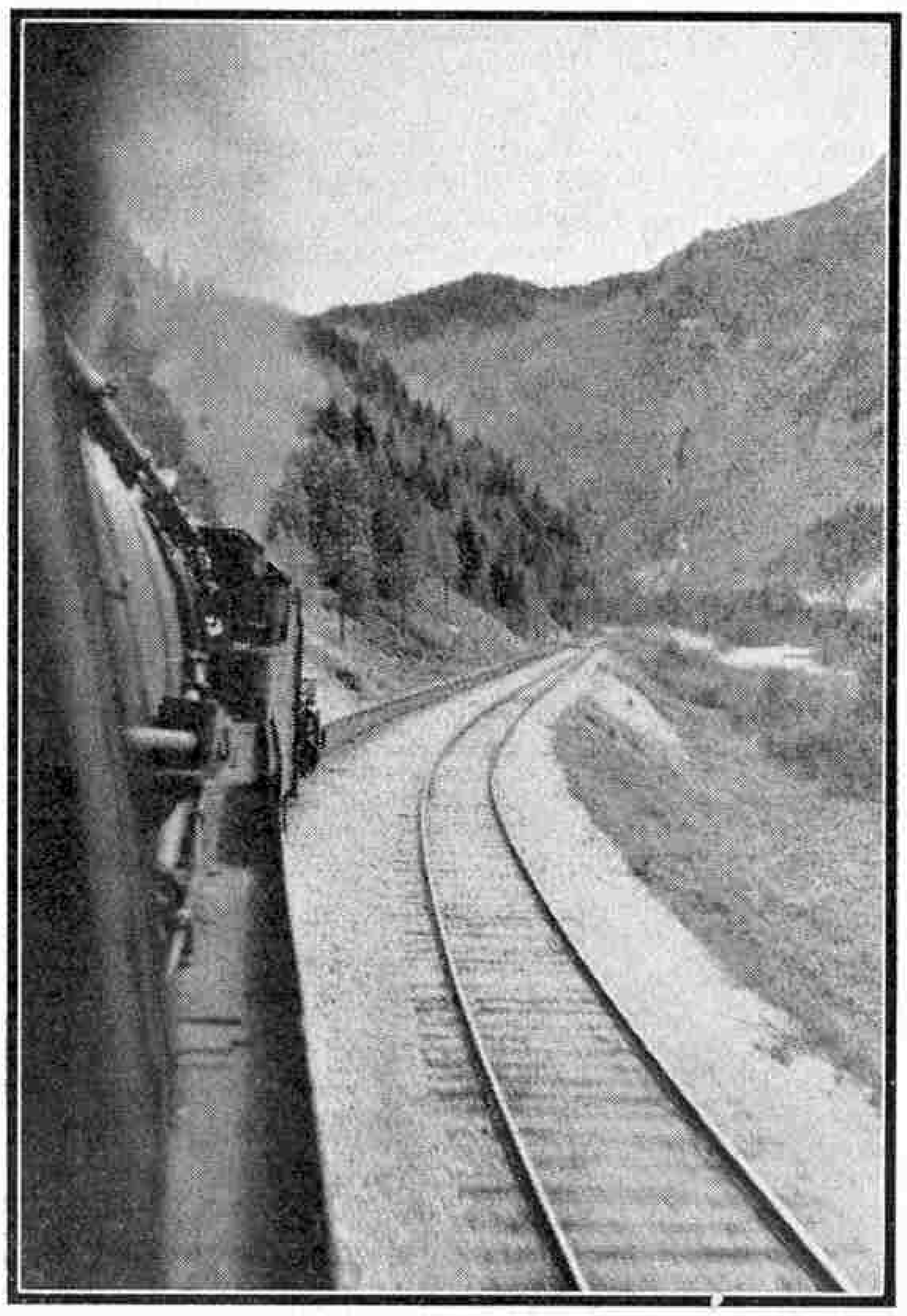
By Eric A. Grubb

IT is shortly after noon at Golden, B.C., high up in the green Columbia River valley between the Selkirks and the Rockies. In the distance appears the locomotive hauling the *"Dominion,"* the crack Vancouver–Toronto flyer of the Canadian Pacific Railway. It looks at first like a tiny dot beneath the smoke trail. Like a bubble the dot swells rapidly, to the accompaniment of a growing rumble. Suddenly a plume of steam waves backward from it, followed by a long-drawn-out whistle blast. Rails tremble at the impact of hurtling tons and spectators on the platform shrink back as the train rolls in on time behind engine No. 5901, a member of the most powerful fleet of mountain-going passenger locomotives operating in the British Empire to-day.

Almost before the wheels have ceased turning the engineer is on the ground oiling and inspecting the running gear. The fireman swings to the top of the tender to replenish the water supply. Ahead, the "helper" or pilot engine, that is to assist the train up the incline through the Kicking Horse Canyon, backs slowly down to couple on in front of the train engine No. 5901. There is work ahead that demands brute strength and No. 5901 is going to need help, for to-day the *"Dominion"* consists of fifteen heavy all-steel cars.

In the observation car and in arm-chairs and staterooms the passengers are at ease in the comfort of an air-conditioned atmosphere. Promoted for the time being from passenger to crew, I am going to ride that mighty-muscled locomotive in front from here up into the western fringes of the Rockies at Field.

When you look at engine No. 5901, pride of the Canadian Pacific, standing there panting softly, you wonder how Man could build a locomotive so long and so high. Here is an oil-burning giant with a long, lean body and a weight so great that bridges and tracks had to be specially strengthened before she and her 19 sisters could work on the Mountain Division. Within its massive form, fire and water struggle to create a driving power of 4,200 h.p., or enough to supply the electric light and power needs of Golden quite easily. The engine is equipped with a big 12-wheeled tender that accommodates the 4,350 gallons of fuel oil and the 12,000 gallons of water needed to satisfy the engine's monstrous appetite. It helps to give the great machine a length of over 98 ft. between front and rear couplers, and a total weight of 376 tons.



An unusual view taken from the driver's side of the cab of the second of two giant C.P.R. 2-10-4s hauling the "Dominion" up the difficult gradients of Kicking Horse Canyon.

In the big vestibuled cab, 10 ft. above the ground, Engineer O. Johnson and Fireman R. McKay are seated on leather cushioned seats, one at each side window. They have brought the *"Dominion"* 90 miles over the summit of the Selkirks from Revelstoke, and are now on the last lap of their day's run. Each shoots me a friendly grin as I climb up and present my credentials. Johnson is white-haired and is robed in blue overalls, with a peaked cap set over a smooth strong face that looks like carved steel. McKay is younger, but has the same lines of experience in his face and the same air of confidence and dignity that is earned by years of experience in his exacting calling. The two are members of the all-star team of Canadian railroaders who pilot the *"Dominion"* daily on the many stages of its journey across Canada, and their particular section is the 125 miles of rugged mountain railroad that stretches between Revelstoke and Field, out in British Columbia.

Driving on this section is a steel-nerved, two-fisted task and one that holds a top place among the skilled crafts of modern industry. It demands the finest in character and physique that men have to offer after years of arduous training, because the hairpin turns and maximum grades—not to mention the annual pranks of Old King Winter—make this section one of the most trying stretches of main line track in the country.

The train is now ready for the "off" again and the conductor comes forward with a clearance card and a train order, which he hands up to Johnson. Brakes have been tested and the brake valve in the second or train engine's cab is cut out according to operating practice when double-heading, thus giving complete brake control to the engineer on the leading engine.

A voice calls *"Boaaarrd!"* and promptly at 12.25 we get the signal to start. Johnson instantly reaches forward to hook open the throttle. For just a moment there is silence, the big engines easing ahead almost imperceptibly as they strain against the inertia of the 1,200-ton train. Then a pair of explosive barks from up ahead, and then another, and others follow in quickening rhythm. No. 5901's great body trembles with power as her drivers grip the sanded rails beneath them and surge ahead. McKay turns oil jets with a gauntleted hand, touches a valve here and a lever there.

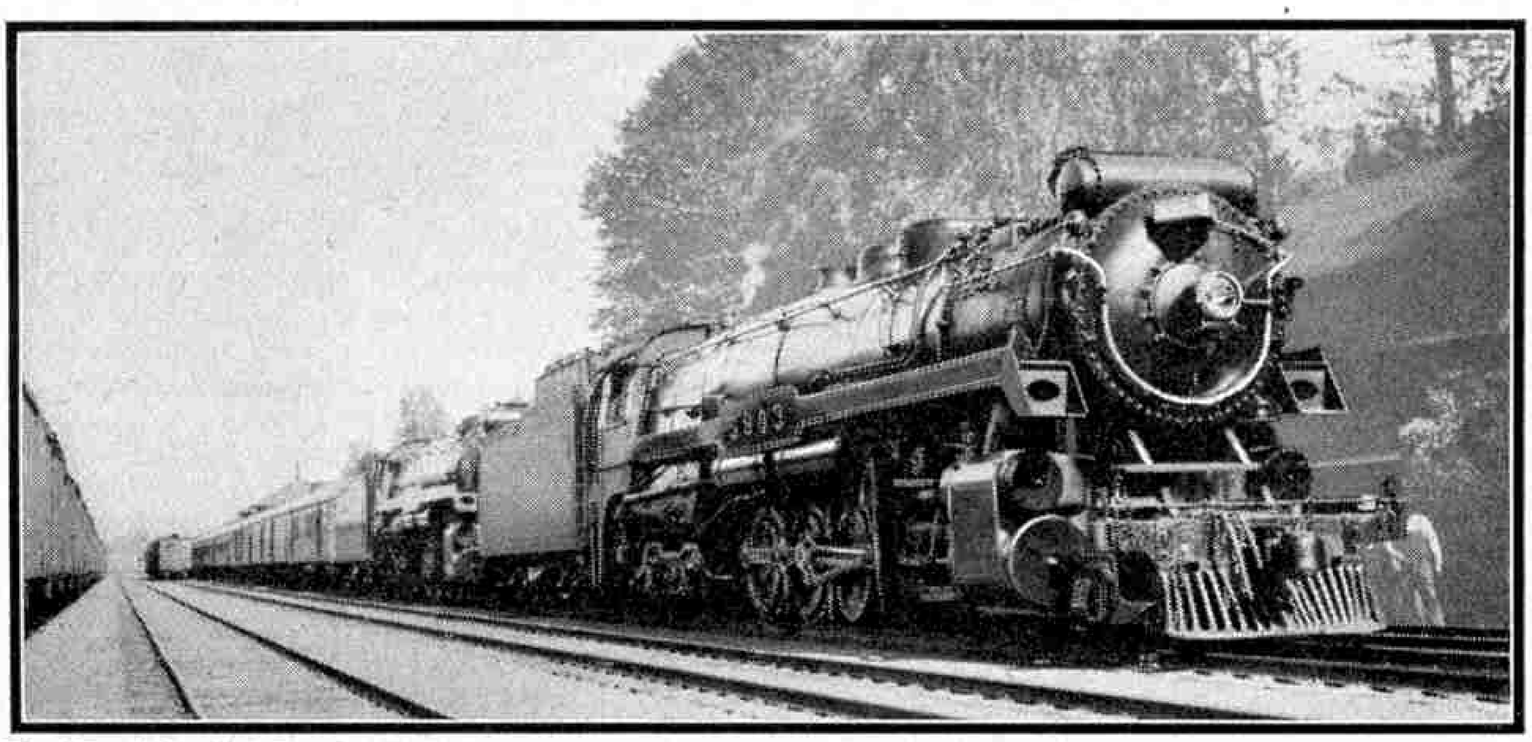
With blasting exhausts beating from their stacks in unison the two engines whip the *"Dominion"* past the yard signals and out on to the open road. Back in the long line of cars the passengers settle themselves comfortably to stare out at the panoramic landscape. Up in the cab it's another story—there's action here as the locomotive settles down to work. Directly ahead stretches the Kicking Horse Canyon, a terrifying gorge cut through perpendicular walls of rock hundreds of feet in height. The track climbs up through it on an 18-mile ascending grade of 1 in 50! At the top is a short easy stretch and then another long climb up to the doorway through the Canadian Rockies, the Kicking Horse Pass at Field. This makes a total ascent of 1,500 ft. in 35 miles, and it's a hard climb for even No. 5901 and her partner.

The cab is the nerve centre of this tremendous mechanism. Its forward wall is the fire-box, a great black slope clustered with a maze of dials and polished handles. Concealed on the other side is 100 sq. ft. of roaring fire. At the rear is the bulkhead of the tender. As we get well under way Johnson eases out the bronze throttle arm with the hand of a master. Back it comes on the quadrant, notch by notch, and at the same time he lengthens his cut-off to get greater power. 5901 responds with rhythmic pulsating blasts that seem to come from the bottom of her lungs—long, deep strokes indicative of heavy work. In front of me, over on the left, McKay busies himself with the valve that controls the oil sprays in the fire-box. No more the sweating fireman toiling with his coal scoop in the face of intense heat from the open firedoor; No. 5901 is modern, and oil is much cleaner than coal on the mountain grades where the engines blast their way up to the summits with volleying exhausts. Her fire-box is so vast that steam must be harnessed to spray the food into it at the rate that the appetite demands.

A short distance from the town, a long gentle curve, banked for speed, leads abruptly into the jaws of the canyon and the *"Dominion"* is swallowed by towering walls of granite. Exhausts shoot skyward in long, darting columns as the locomotives charge the long grade ahead. To the right is the Kicking Horse River plunging and reeling on its way downhill to join the Columbia at Golden. On the left we are flanked by solid rock. In a few moments

we leap across the stream on the slender limbs of a steel span, cut through a jagged toe of rock and recross the stream. The passing track at Cloister darts from under us, runs alongside for a short distance and then merges with the main track again. Like the coils of a giant serpent we twist and turn through the rocky slit that is our pathway.

Suddenly, on the right, a white flash of a station mile-board, then a long wail of the whistle sounding above the thundering. Rounding a curve we come upon a little station, sentry post of the rails, nestling there in the black depths of the gorge. As we pass we see through the windows the shaded lamp on the telegraph desk, and out in front, the vigilant operator alert for the bundle of newspapers tossed from the baggage car.

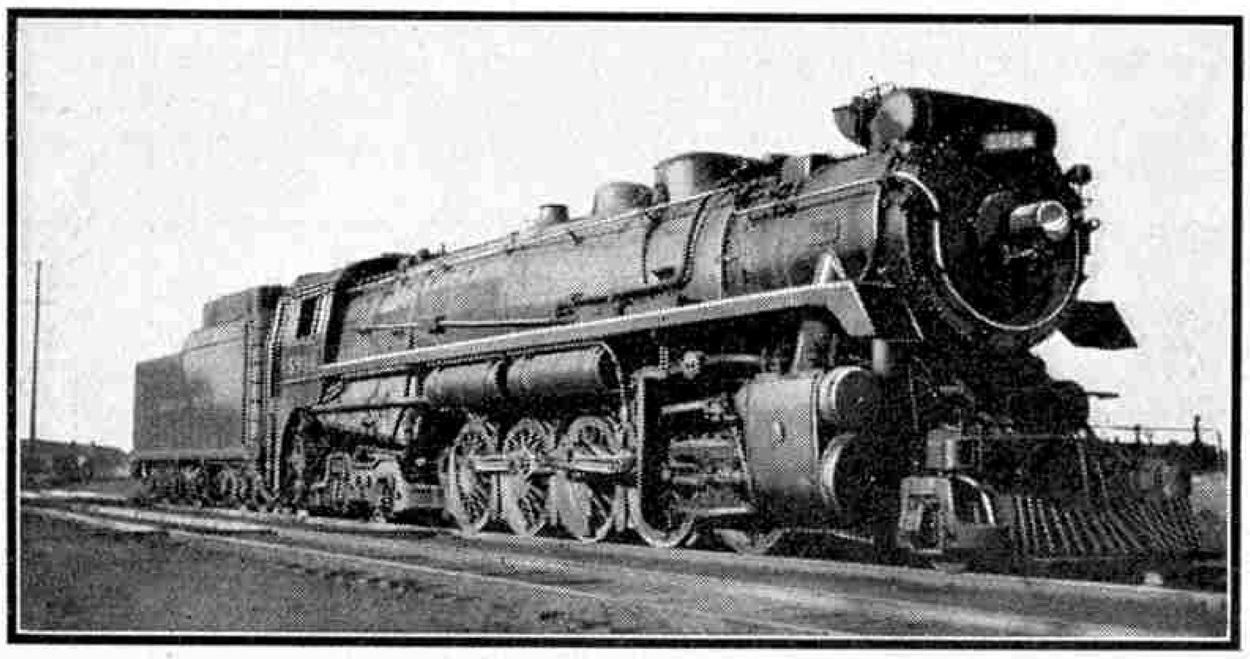


The "Dominion" at Revelstoke, B.C. Both the engines are of the 2-10-4 type of the same class as No. 5901, on which our contributor made the thrilling trip described in this article.

Automatic block signal masts, too, slide by beside the rails at continuous intervals. These silent "policemen" with their coloured blades by day and flashing lights by night stand guard over the safety of the many trains that are constantly moving in opposite directions over the Division. They are the voice by which the railroad speaks to the engineer. *"Clear board,"* calls McKay as each one glides into view with its arm pointed vertically to the sky. *"Clear board,"* verifies Johnson. Every signal is checked thus by the enginemen; nothing is left to chance.

There is no place on earth quite like the resonant atmosphere of an engine cab. This is the place to feel sensations. This is where you hear the song of the rails sung best. The rumbling roar of the exhaust, the rat-a-tat of drivers rapping the rail joints, the deep melodious wail of the big chime whistle as it howls mournfully through the canyon, and the dull surge of white flame in the fire-box as the oil changes to power with a deafening roar blend into a chorus that every railroader knows and loves. The passenger sitting amid the luxury of an ultra-modern train hears nothing of it. Up here in the cab you can see, smell and feel No. 5901 exerting herself. You can actually feel her monstrous body trembling with power as she goes beating up the grade. Her movement is solid and substantial, yet the cab is not uncomfortable riding. There is hardly any more sway than in the Pullmans themselves.

To one leaning far out of the window with head past the glass windscreen, the wind is cutting. Beneath can be caught just a glimpse of the great knuckled cranks and polished side-rods whirling round in wild circular movement as the plunging pistons push the steel behind us. Looking ahead, down the long barrel-like sides of the boiler, you can see the roadbed rushing toward the churning wheels in a grey, liquid stream. Now, what a sight behind as the locomotives swing into a sweeping curve! There's the long train all stretched out on the bend. Express and baggage, mail and sleeper, diner and observation car, 15 heavy steel coaches rolling through the hot mountain air. Listen to the exhausts as they echo and re-echo from the rock walls like thunder, the wail of the whistle. Hear the roar of the river as it strives to outdo the noise of the train. This is railroading!



A C.P.R. 2-10-4, No. 5914, at Calgary. These engines were designed specially for work over the Canadian Rockies. Photograph by our reader A. H. Coverdale, Calgary.

Even the track watchmen whom we pass at intervals betray a thrilled sensation as we roar by. They gaze reverently up at us, but their faces break into smiles as we raise our hands in salute, that indescribable gesture that is at once a personal greeting, a salute to a fellow in the service, the high sign of the fraternity of the singing rails, and a farewell.

As we climb higher and higher the panorama becomes more impressive. Tunnels straddle our path and the canyon sides become steeper and still more rugged. The river boils and seethes along the floor of the gorge, which is here barely 30 ft. wide in places. The track is forced to find what foothold it can in the solid rock. About 600 ft. above us that section of the Trans-Canada highway between Golden and Field can be seen threading its way along the cliffs; a motor car travelling along it looks no bigger than a mere dot.

Over on the right, the breeze fluttering his cap, Johnson leans far out of the cab window. His lean left-hand dangles on the throttle latch, touching it now and again. The air-reverse is set to get maximum power. Except for an occasional glance at his watch and a sweeping look at the trembling needles on the gauges his eyes are glued to the winding track ahead.

A long tunnel cut through a shoulder of the mountainside looms up suddenly. "This hole is hot," yells McKay in my ear. "Clear out your lungs and you'll breathe easier." With a warning shout of the whistle we swoop into the rock and are swallowed up in the blackness. Immediately the intense heat of the engine cab wraps itself about you like a cloak. Clouds of exhaust steam beat into the cab and swirl about, revealing a single glaring peephole in the firedoor. The pulsating rhythm of the two locomotives is deafening. Then, after moments of plunging headlong into a roaring darkness the train suddenly swings out into the daylight again with an abruptness that leaves ears ringing.

At length, one hour from Golden, we emerge from the canyon and reach the top of the grade at Leanchoil station. The pilot engine is taken off, the air brake is tested and we are off again. As Johnson eases out the throttle No. 5901's drivers spin wildly on the slight ascent, so he cuts in the "booster," or auxiliary engine, which increases the tractive power from 77,200 lb. to 89,200 lb.

Ahead the route is up the narrow and now wooded valley of the Kicking Horse River, 17 miles of hard running between the pinnacled Ottertail and buttressed Van Horne Ranges, up into the western slopes of the Rockies. We run downhill for five miles to Misko, where we find the westbound *"Dominion"* waiting for us on the passing track. We clatter by, catch a glimpse of white cloth, gleaming silverware, and passengers at ease reading magazines. The tangents shorten and more curvature appears as we start to ascend into the foothills. The cut-off is lengthened for the climb and the exhaust beats out of the squat stack like a drum roll. The signals come and go with steady regularity. Now the peaks close in about us on all sides as though seeking to trap us and bar our passage. They tower upward, tier on tier, with the heads of some reaching nearly a mile above the valley floor.

Johnson and McKay seem even a trifle more alert as they guide the precious coaches around the tortuous curves. The engineer is composed, relaxed physically but keenly alert mentally, the right man on the right job. McKay too, besides watching his oil-feed, water and steam gauges, maintains a sharp lookout along with his running mate.

The little telegraph stations of Ottertail and Emerald glide by, nestling deep in the evergreens and then the Field mile-board flashes by on the right. On time at 2.05 we stop at the platform, and mechanics immediately attack the connecting rod bearings with grease guns. No. 5901 will go on to Calgary, but Johnson and McKay stop here to work Train No. 1 back to Revelstoke to-morrow morning. The new crew climbs on and another pilot engine is coupled up, and in 15 minutes the *"Dominion"* pulls out on the next lap of its journey.

This article is reproduced by courtesy of the Editor of the *"Family Herald and Weekly Star,"* Montreal.

Britain's Water Highways

The Fascinating Story of Our Canals

By Sydney Moorhouse, F.R.G.S.

THERE are few stories so fascinating as that of our British transport and highway systems. Throughout the successive centuries one method has succeeded another and prevailed for a time, and then in turn has been displaced by a speedier and cheaper mode of transit.

During the middle ages travel was almost entirely confined to horseback, and goods were taken from one part of the country to another in panniers borne on the backs of those most patient of all drudges, the pack-horses. In this way an insular system of trade was built up, and on the Pennines of the North, the downlands of the South and the mountains of the Welsh borderland, are numerous old tracks along which long convoys of heavily-laden beasts wended their heavy way from town to town.

Transport in this fashion of course was both slow and costly. The first break came in 1759, when the Duke of Bridgewater obtained an Act of Parliament to enable him to construct a canal from Worsley, where he had extensive coal mines, to Manchester. Coal had then to be sold in Manchester for almost double the price it fetched at Worsley, owing to the expense of carrying it by pack-horses, and this operated very unfairly on Manchester people.

The engineer who was given the task of carrying out the project was James Brindley, a Derbyshire man who had received only the humblest education, but had developed great engineering skill and enterprise. He succeeded so well that soon canals were ousting the pack-horse as a means of transport all over the country. This is not surprising, for it was said that a single horse could tow a barge carrying a load that would ordinarily require 500 pack-horses!

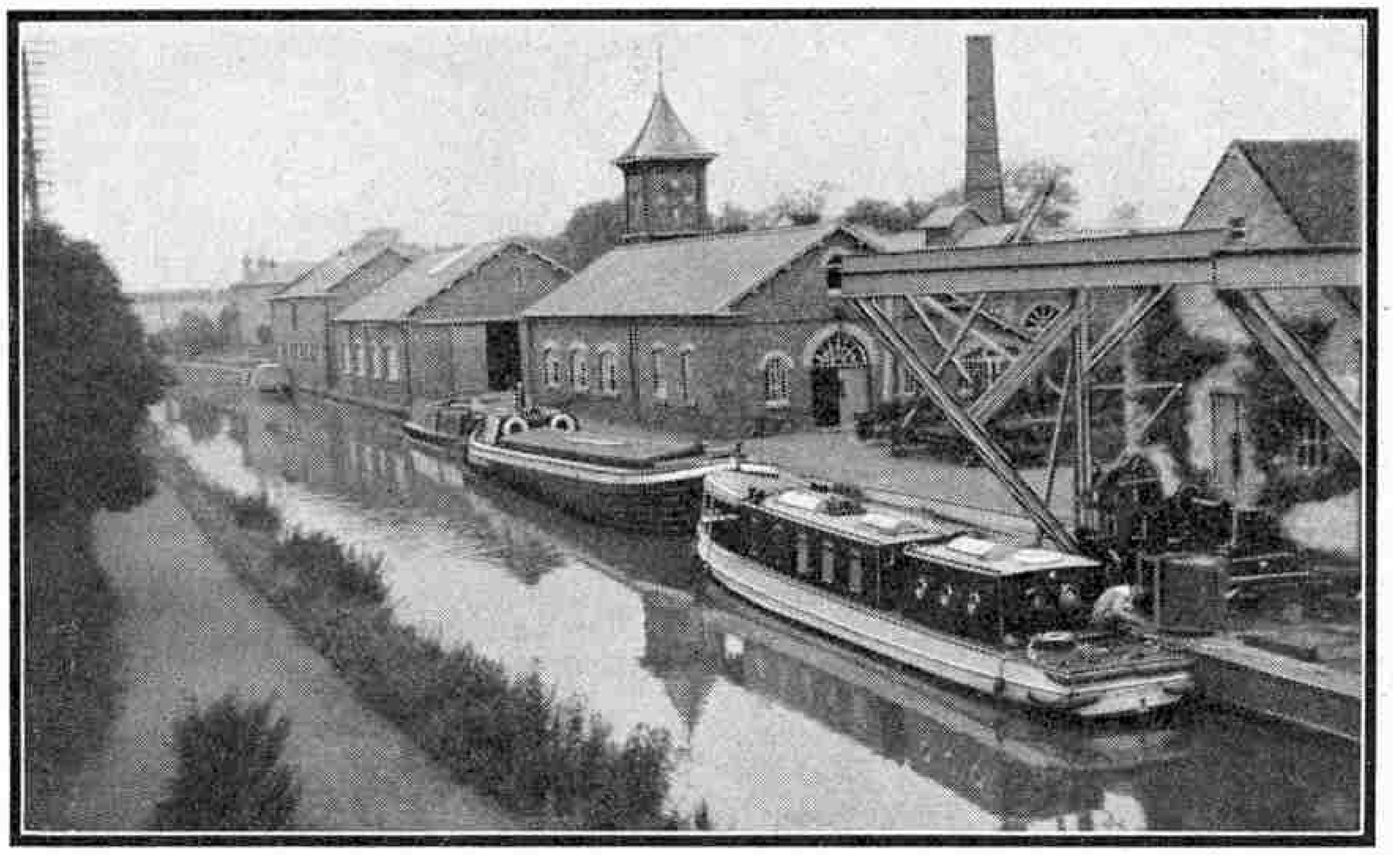
Innumerable difficulties confronted the early canal engineers, particularly in hilly country. Brindley's scheme to construct a perfectly level canal with a length of 10 miles was treated with scorn by many of his rivals, and when they heard that he proposed to carry his waterway across the River Irwell at Barton on an aqueduct he was laughed at as a madman planning to build a castle in the air. The aqueduct soon became a reality, however, and was looked upon as the greatest engineering feat of the day.

Although Brindley's canal was the first of our commercial waterways, there are evidences of canal building long before the 18th century. It is said that the Fossdyke, which joins Lincoln with the Trent, was built by the Romans, and the Caer Dyke, connecting Witham and Peterborough, is also believed to be of Roman origin.

Another historic canal is the Royal Military Canal, in Kent, and in 1936 a three-mile stretch of this east of Appledore was presented to the National Trust to be preserved for the nation for all time. This unique waterway was constructed as a defence against invasion in the time of the Napoleonic wars, and cost about £200,000. It originally ran all round Romney Marsh.

Although our modern railway system has superseded the canal as a popular means of transport, our inland waterways are by no means decadent and in most parts of the country we can still see how the engineer defeated the natural obstacles imposed by gradients and mountainous barriers.

The lock is the most common method adopted of carrying a canal up a hillside. This consists of a chamber, usually built of brick or masonry, which is provided at both ends with a gate or gates and sluices that can be opened to allow the level of the water inside the lock to be



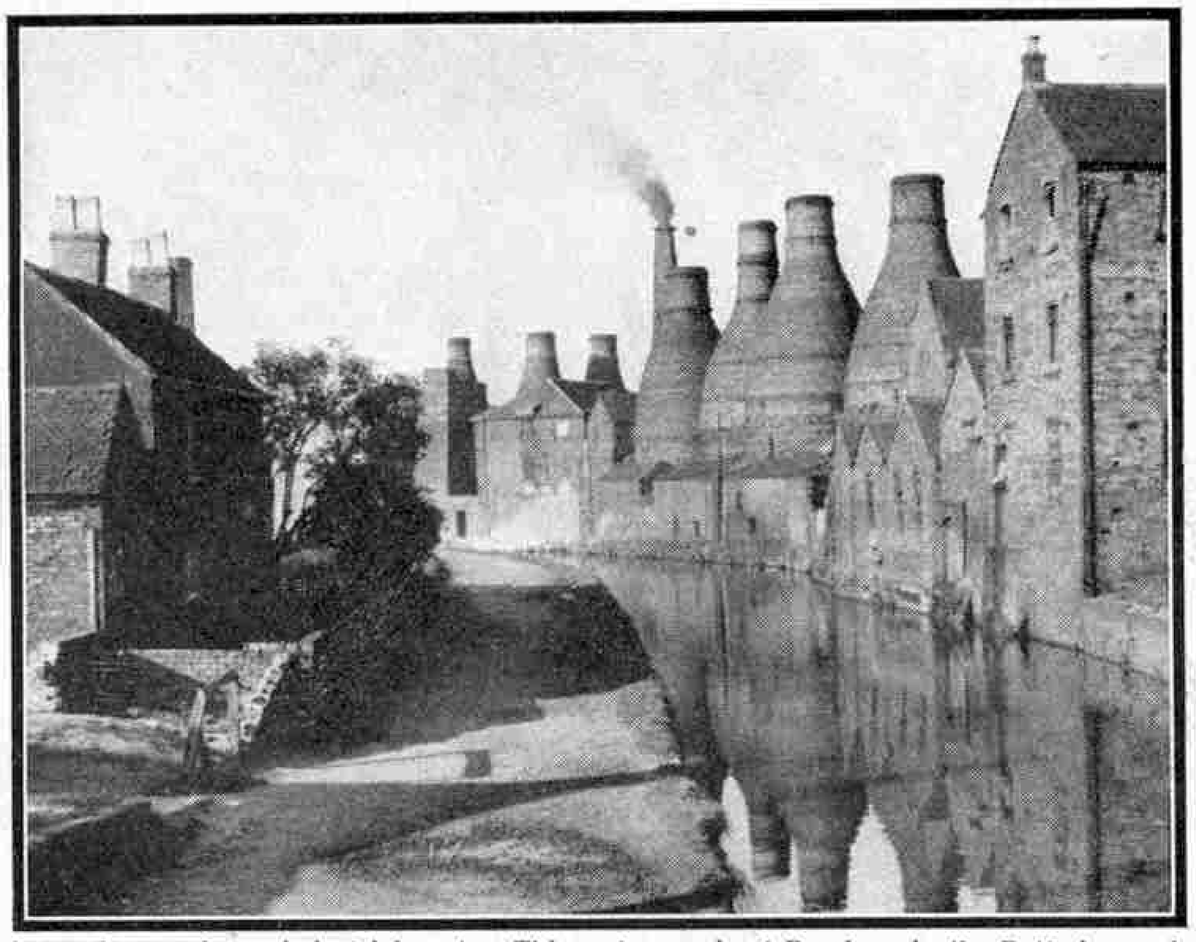
The Grand Junction Canal at Tring, Hertfordshire. This canal originated in 1793, and now forms part of the system of the Grand Union Canal Co. Ltd.

A lock on the Wey Navigation at Newham, near Weybridge, Surrey.

brought to that of the waterway at either end. One of the largest locks on our English canals is at Eastham, where the Manchester Ship Canal joins the Mersey. It is 600 ft. long and 80 ft. wide.

Locks follow each other in rapid succession on a canal that is built on a long steady gradient. There are no fewer than 58 in the 16-mile stretch of canal between Worcester and Tardebigge, with a continuous flight of 30 locks, the largest number in any flight in England. There is another long succession of locks of this kind between Romiley and Marple, in East Cheshire.

When the gradient is exceptionally severe, what is known as the staircase type of lock is employed. In this type the bottom gate of one lock acts as the top gate of the next, and "one-way traffic" only is permissible at these places as there are no intermediate pools where barges can pass each other. At Bingley, on the Leeds to Liverpool Canal, there is a fine set of five such locks, the largest in this country, giving a total lift of nearly 60 ft.



A canal scene in an industrial centre. This waterway is at Burslem, in the Potteries, and pottery kilns are prominent on the right bank.

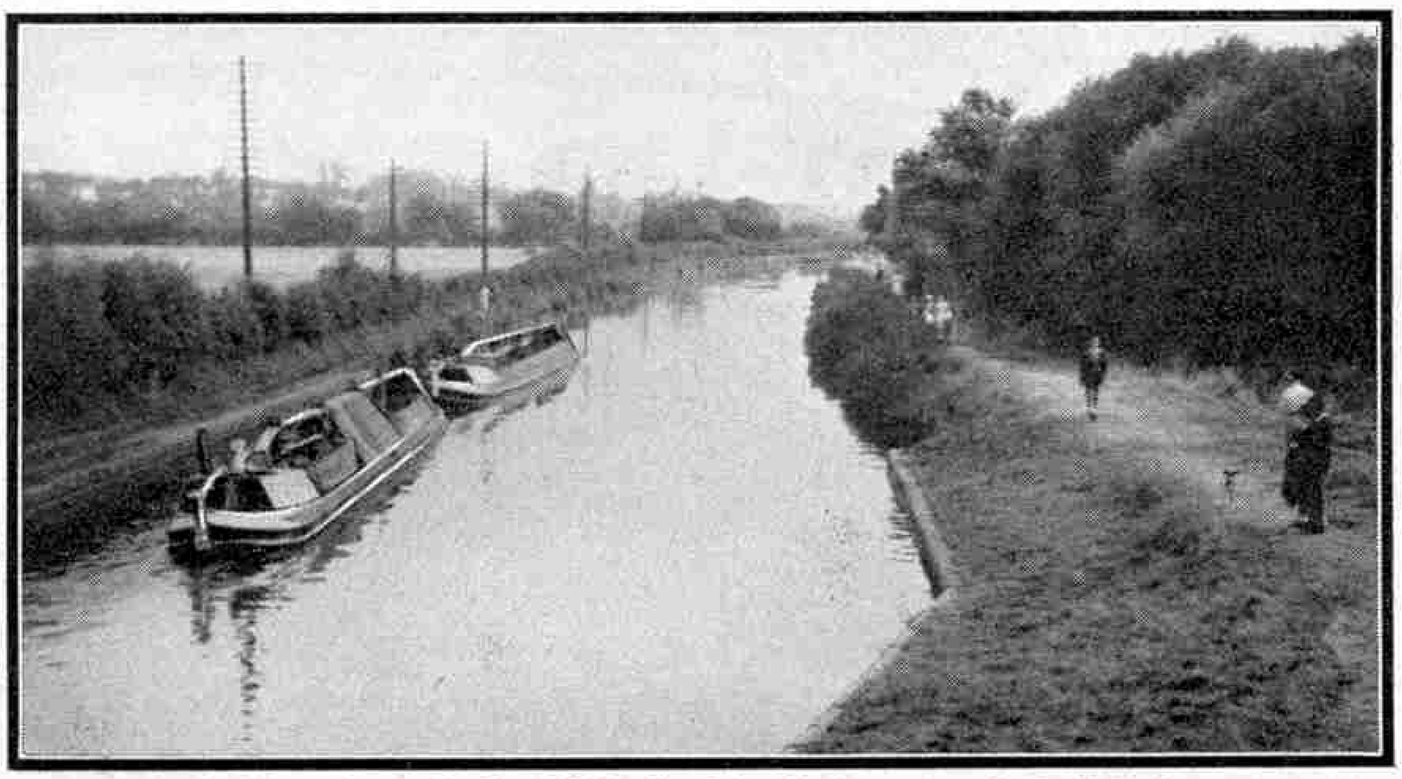
The most difficult and expensive part of a canal to maintain is that on the summit levels, and several methods are adopted to ensure an adequate supply of water there. It must be realised that a lockful of water is consumed every time a barge passes through, and this water normally passes down to the lowermost reaches. Sometimes the lockful of water is pumped back again, however, and pumping stations designed for this purpose can be seen at Tring in the Chiltern country. In other places side pools are provided beside the locks, and these collect some of the water displaced, allowing it to flow back and replenish part of the lock when next it is filled.

Canals are fed by rivers or by pumping from storage reservoirs constructed to collect the surplus water that passes down the locks. Special reservoirs, on high ground, similar to those used for providing water to towns and cities, also are used for ensuring a regular supply of water for the canals. Reservoirs constructed for this purpose can be seen beside the Oldham and Huddersfield road near the summit of the Standedge Moors.

Even more interesting than the locks are the lifts that in certain places are employed in order to overcome sudden changes of level, or for providing communication between two canals. The finest of these is at Anderton, near Northwich, Cheshire, where it connects the Weaver Navigation with the Trent and Mersey Canal, and is operated electrically. The lift is vertical, with a height of over 50 ft., and with its aid large barges can be transported from one canal to the other. A full description of this interesting lift appeared in the "*M.M.*" for August 1936.

At Trench on the Old Shropshire Canal there is a different type of lift. This is arranged on an inclined plane and consists of two lines of parallel rails, on each of which is a trolley with a wire rope passing round the wheel of a winding engine. Barges formerly were hauled up the lift on the trolleys, but this method is no longer in use.

Tunnels were constructed when a large barrier of hills interfered with the progress of canal works, and many of these can still be seen. The towing path often stops at the entrance to one of these and it is worth while to stay here and watch the method employed in taking the barge through. In some cases one of the men on board pushes a long pole against the top or side of the tunnel, and at the same time walks aft along the boat, which is thus propelled forward. Other tunnels are not built sufficiently high to allow this to be done, and there a method known as "legging" is adopted. Two men lie on their backs at each side of the fore end of the boat, and by pushing with their feet against the sides or roof of the tunnel move the barge along. Naturally this is very strenuous work, and it is not surprising that bargemen welcome the appearance of the motor tug, which is now coming into use on our artificial water highways.



A pleasant view on the Grand Union Canal showing barges near Denham, Bucks.

The longest canal tunnel in England is the Standedge Tunnel on the Huddersfield Narrow Canal. This is 5,415 yds. in length and runs alongside the railway tunnel. It is not used for commercial purposes to-day, but it is kept in good repair and parties can be taken through it by arrangement. The journey is one of the most eerie and fascinating that can be undertaken, for the darkness surrounding the barge when in the middle of the tunnel is so intense that even the strongest electric torch seems powerless to penetrate the gloom. An empty barge can be poled through, but even so the journey takes from 2½ to 3 hrs. and poling becomes very hard work. Laden barges had to be taken through by "legging"

(Continued on page 358)

1

2

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Boys! If you're out to get the last ounce of fun from the most thrilling of all outdoor hobbies, get a Hornby Speed Boat!

Model motor boating is one of the least expensive of all summer pastimes, and provides hours of fun and excitement. It can be carried on at any time without special preparation, either alone or with friends.

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INNS ROAD – LIVERPOOL 13

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(10) *Ventilators.*

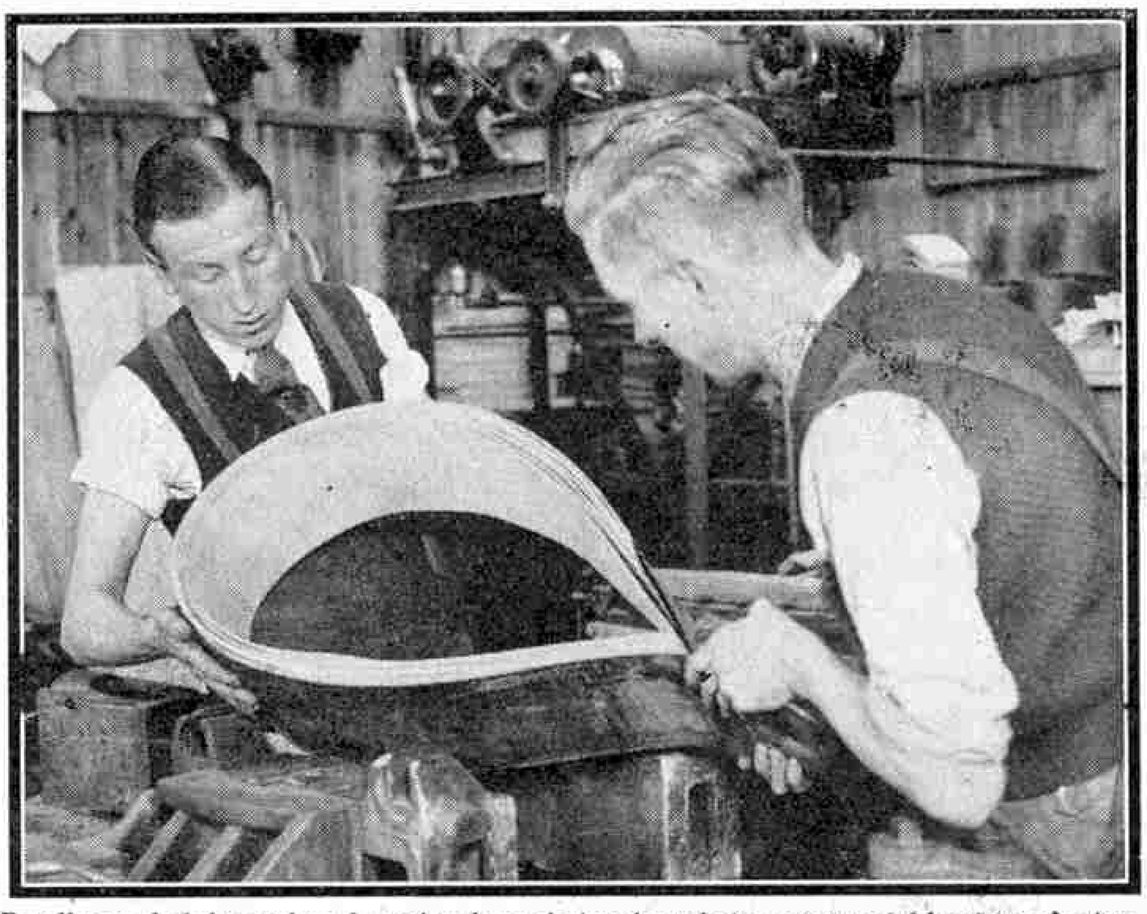
HOW THINGS ARE MADE:

Tennis Rackets In A Modern Factory

By H. Lethaby

I WANT you to imagine that with a number of other readers of the "*M.M.*" you are paying a visit to the Tennis Racket Factory of Goodwood Sports Ltd. in South East London. If you are interested in seeing the works of nature turned into the work of man I am sure you will not be disappointed by the result.

First of all I must tell you that until only a few years ago tennis rackets were made almost exclusively from English ash, and from beginning to end the processes were carried through entirely by hand. The trees were rent into sticks, each large enough to make into a tennis frame. These sticks were steamed in a large chest until they were saturated and pliable, after which they were bent to the required shape and left for some months to dry and season. At the end of that time the wires or clamps that had been holding them in shape were removed, and wedges cut roughly to shape were glued in position. Equally rough handles were then stuck on, and after the racket frames had been moulded or shaped by hand they were laboriously drilled to receive the gut, polished, strung and finally stamped with the maker's name and trade mark.

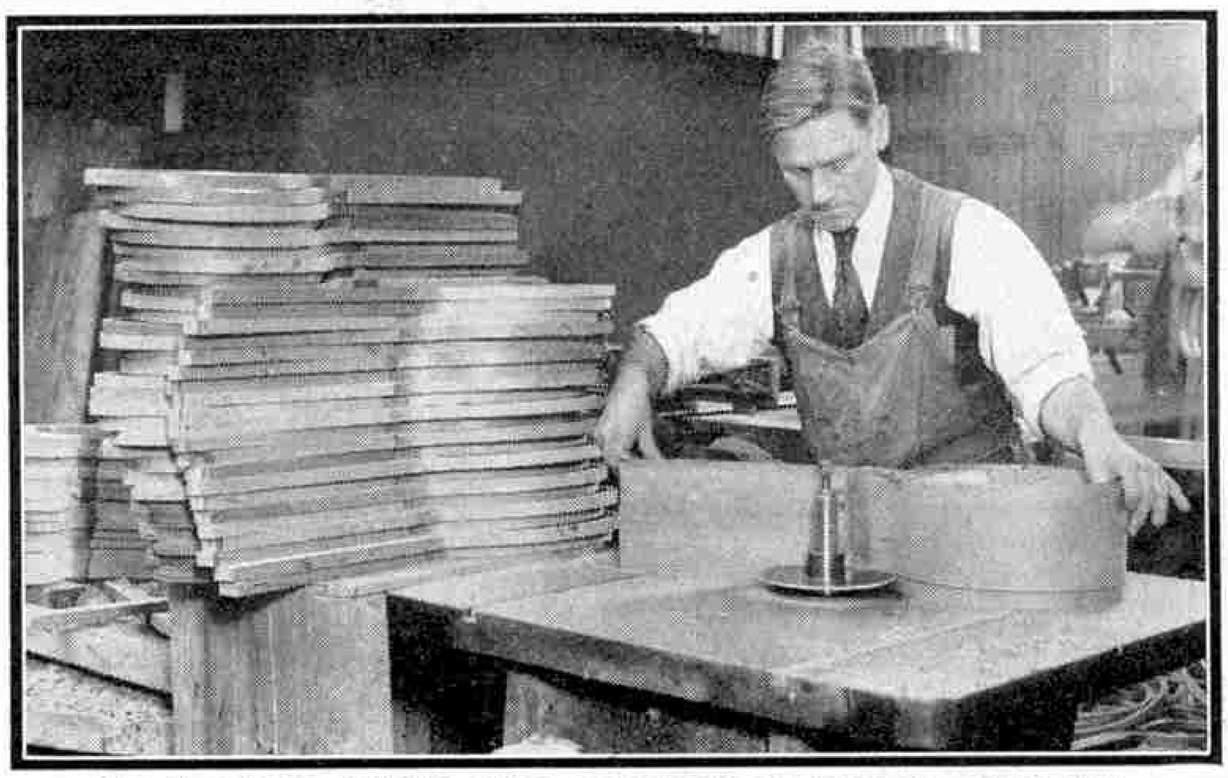


Bending and gluing strips of wood to form six tennis rackets, a process taking two minutes. The illustrations to this article are reproduced by courtesy of Goodwood Sports Ltd.

All this work took considerable time, so perhaps it was a blessing in disguise that tennis was not so popular in those days as it is now. Our grandfathers and great-grandfathers who made rackets in the old days would look on with much surprise, and probably with disapproval, if they could visit one of our modern factories. "Fancy!" one can almost hear them saying. "Using beech, sycamore, birch, walnut, lime, horse chestnut, maple, mahogany and all these other woods, when ash is the only one suitable for making into tennis rackets." If the ways of making rackets were the same now as then, they would be right, but in these modern times the steaming chest is seldom if ever used, nor is the long period of drying and seasoning necessary to-day.

After this glimpse of the past history of the sports trade, let us return to the present and commence our journey round the factory. First of all we find a yard full of huge logs of trees, waiting their turn to be cut up into thin strips. The thickest strips we cut in the factory are of 10 gauge, that is approximately $\frac{1}{8}$ in. in thickness; but fractional inch measurements are not precise enough in deciding the number of strips required to make into a racket, so we use millimetres and decimal fractions of millimetres in measurements. The frame of every tennis racket leaving the factory must measure within 1/10 of a millimetre of our standard gauge, which is 13.480 m.m. For instance, a nine-piece laminated racket would probably consist of four pieces of 13 gauge timber, each 2.337 m.m. in thickness, making a total of 9.348 m.m., and five of 21 gauge timber, each of .813 m.m., with a total thickness of 4.065 m.m. Thus the combined thickness will be 13.413 m.m., which is within the required limits of measurement.

It must not be supposed that these strips are only wide enough to make one racket at a time, and on entering the Gluing and Bending Room you will see a number of strips being glued together to form a block of six rackets, as shown in the upper illustration on this page. The machine that is used for this purpose turns out one of these blocks every two minutes all the year round. It will be realised that a very large number of people will be required to take up tennis if this glutton for work is to be kept in regular occupation!

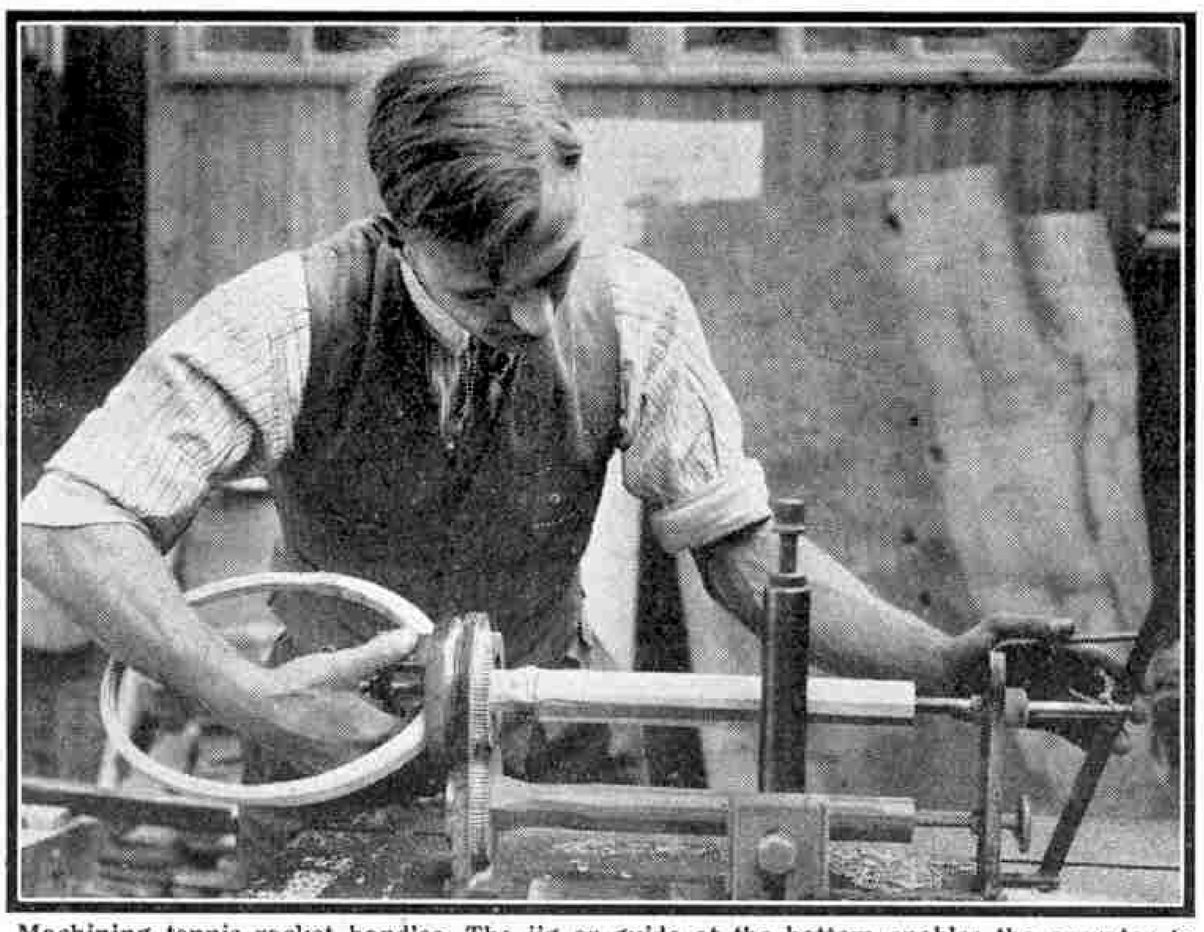


A block of six rackets being cut into separate units by means of a circular saw.

It is hot work in this room, for in it we must always maintain a temperature of 80 deg. F., as otherwise the glue would chill and we should get rackets with bad or open joints. You will notice how the strips of wood go through a patent gluing machine before being placed on a steel strap, which assists the machine to pull them to the shape they will retain for the remainder of

their useful lives in tennis service.

Now let us follow a load of blocks through from the Gluing and Bending Room to the Mill or Machine Shop. There the blocks are cut into slices, each of the right thickness, and the lower illustration opposite shows how this is done. In the same department the handles, which have meantime been glued on by hand, are machined to the required size and shape. This operation is seen in progress in the upper illustration on this page.



Machining tennis racket handles. The jig or guide at the bottom enables the operator to reproduce the size and shape of handle desired.

Although most of the production in the factory is now by machine, there are certain operations that only a craftsman can carry out to perfection, and the most important of these is the hand-making or finishing shown in our remaining illustration. Inexperience in this work can ruin a beautiful racket in a few minutes, but the expert, working generally "by eye" alone, quickly transforms an article that obviously is machine-made into one of individuality and distinction.

One of the most remarkable machines used in making tennis rackets is that with which the frames are drilled. Although this machine is only a little fellow, it costs just about as much as our grandfathers would have wanted to start in business. It drills the holes through which the gut is passed in stringing, and works with unerring precision, making holes of the right size and spacing at the correct angles. Hand drilling was the order of the day before this machine came along, and it would be no exaggeration to say that thousands of tennis rackets were ruined every year during the drilling by hand required by the use of old-fashioned methods of working.

Now let us go into the Polishing Room. This is a very interesting department, for here all the exceptionally smart trimmings and bindings and the artistic transfers are put on the rackets. If I had to choose which department I would work in I feel sure that I should select the Polishing Room, as the work done there is absorbing in more ways than one. In any case there are very seldom any vacancies among the employees in this important room.

Although rackets are now made mainly by machinery, the craftsman is still necessary to give the finishing touches.

It is interesting to note that in the midst of this modern factory, fully equipped with high-speed machinery, a very old method of stamping the weights on the rackets is still in use. A steel stamp is held over a lighted candle and then is pressed firmly on to the side of the racket handle, with the result that the weight number embossed on the stamp is reproduced in candle black on the racket.

And now I have taken you through the whole of the factory except the Stringing Room. Like most other operations in the sports trade, racket stringing has altered considerably during the last four or five years. Before then all stringing was done by hand, and a first-class stringer could often earn more than the factory manager. Now stringing machines are in use. The work is not carried out more quickly with these than with hand labour, but they have the advantage that if necessary they permit the employment of younger and not quite such experienced workpeople, for they are practically fool-proof.

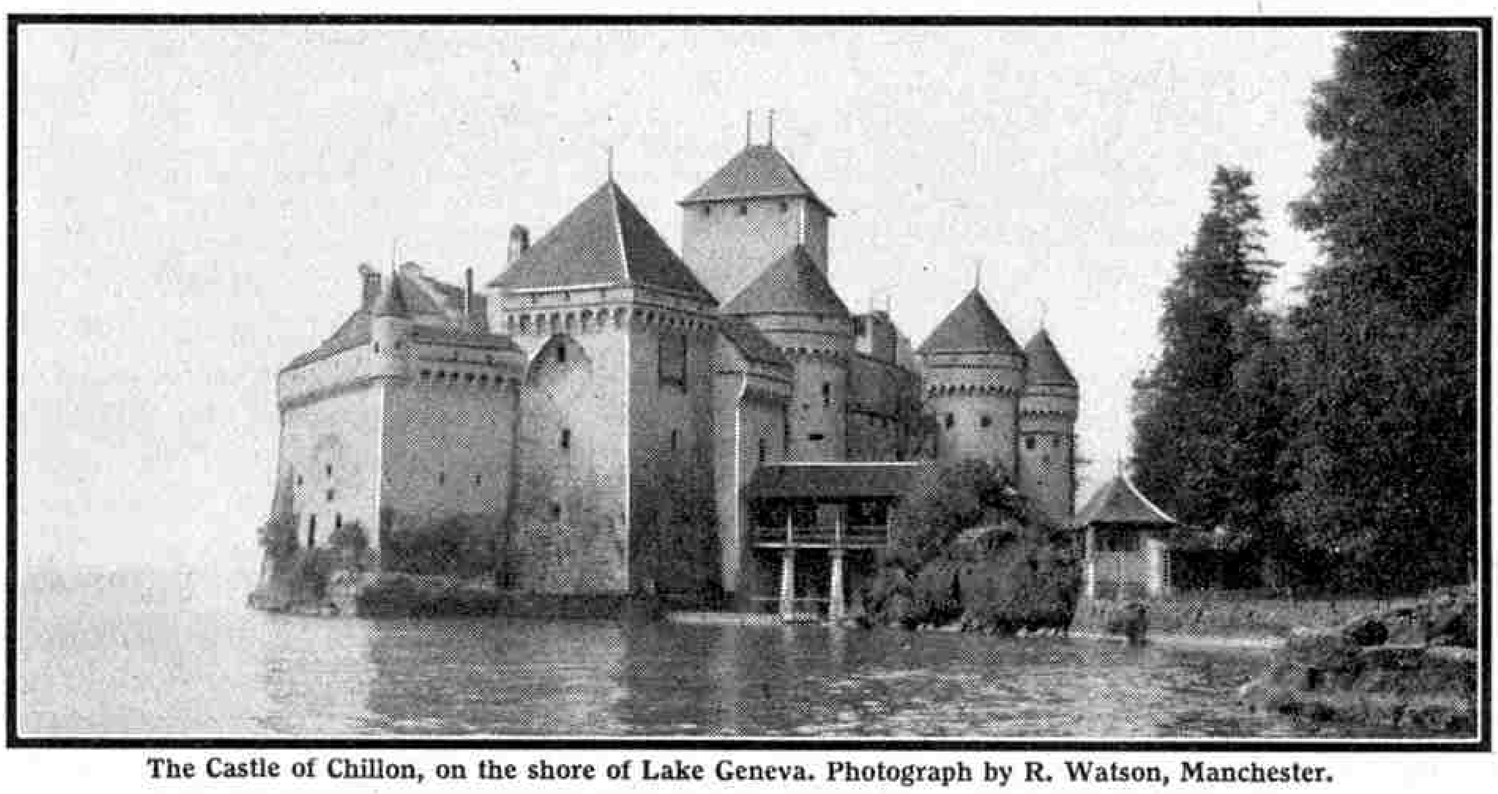
I have referred in this article to the large quantity of rackets made by us each year. It is obvious that the whole output of the factory of Goodwood Sports Ltd. cannot be absorbed in the British Isles alone, where of course there are other manufacturers to share the market. It is necessary to seek openings farther afield, therefore, and the variety of these is perhaps surprising. For instance, few people would imagine it possible to go into a remote town in Yugoslavia, Bolivia or Java and to find Goodwood rackets on sale. Yet this is the case, and indeed there is scarcely a country in the world to-day where British sports goods are unsaleable. In order to open up these markets considerable expense and months of travelling are necessary. Generally when we decide to open up a new market I make the first journey myself, after which at suitable intervals we send representatives to keep in touch with our customers and agents.

It is interesting to know that there are ever-growing markets in the Dutch East Indies and in several European countries as well as most parts of the British Empire. At the present moment the South American trade is being developed, and it will give you some idea of the immensity of the task when I mention that the representative engaged in it will be away from this country for a whole year, occupied in meeting the needs of the people of the various countries there, who are becoming increasingly keen on sports such as tennis.

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

The Castle of Chillon

One of the greatest attractions of Lake Geneva to visitors is the gloomy Castle of Chillon, which has been made famous by Lord Byron's poem. The castle is a magnificent fortress built many hundreds of years ago, and afterwards extended and rebuilt. Its original purpose was to control the old Roman road that passed between the mountains and the lake, and over the famous St. Bernard Pass into Italy.



The Castle of Chillon, on the shore of Lake Geneva. Photograph by R. Watson, Manchester.

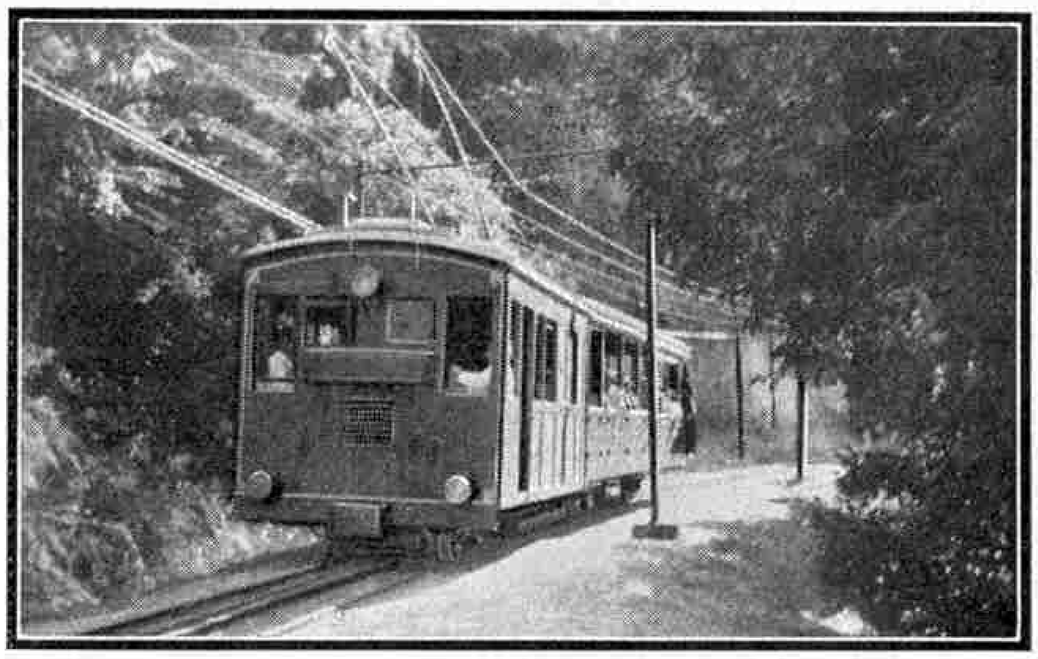
When I visited the castle I was impressed by the grandeur of the building and its surroundings. The snow-capped Alps are mirrored in the blue waters of the lake, and along the shore quaintly-spired villages nestle among clusters of citron trees. Steamers from Montreux and Vevey pass close to the castle, and from them can be seen the outer walls of the semi-circular defence towers with their long loopholes used by archers of bygone days. The castle has a natural moat, and a postern gate that opens on to the lake and in former times offered a means of escape in emergency, or a convenient way of disposing of victims of the gibbet.

The courtyards and towers of the castle suggest that its occupiers in former troubled times were ever on the alert against surprise attacks. The wooden wheels of the drawbridge workings can still be seen, and the courtyards bear traces of the passage of armed men. It is equally clear that Chillon was for centuries the home of the Dukes of Savoy and the Lords of Vevey and Chillon, for their coats-of-arms still adorn the black marble pillars of the great halls. Many of these halls, notably the ladies' apartments, the treasury and the chapel, bear witness to the dignity and splendour of life in the stronghold in the dim past.

The most interesting part of the castle is the network of subterranean passages that were once used as dungeons and torture chambers. It was there that Bonivard, Byron's famous "Prisoner of Chillon," was chained to a pillar for four years, until released by the Bernese when they captured the castle in the year 1536. R. Watson (Manchester).

Climbing the Corcovado

Near Rio de Janeiro there is an interesting rack railway that climbs Mount Corcovado, reaching a height of 2,200 ft. above the city. The average gradient is 1 in 5, the maximum being 1 in 3, and the track is single, with loops to allow trains to pass each other. The rack resembles a ladder, with the rungs of which the teeth of a wheel on the engine engage.



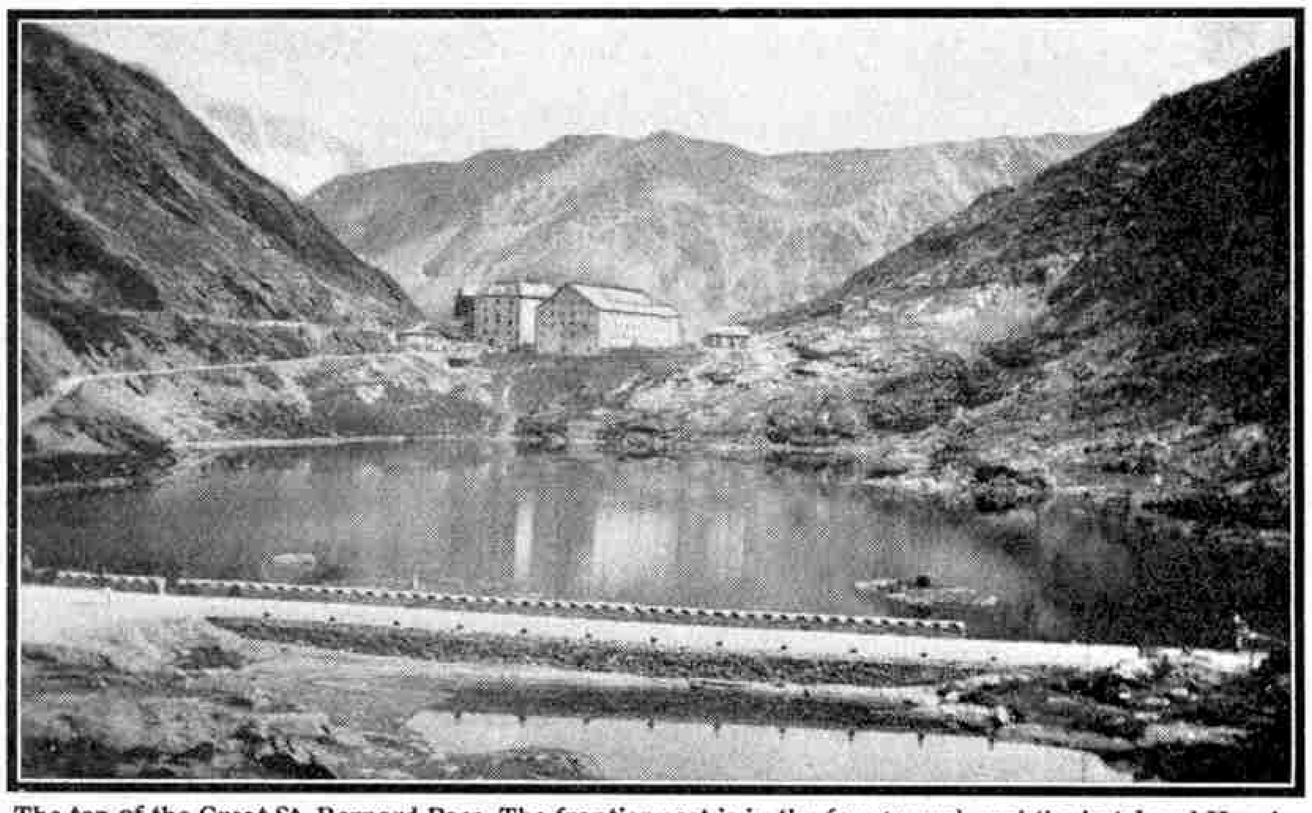
A train on the rack railway that climbs Mount Corcovado, Rio de Janeiro. Photograph by P. H. McLauchlan, Rio de Janeiro.

Trains on this mountain railway start from Cosme Velbo Station, and take an hour to reach the top, stops being made at Sylvestre and Paineiras on the way. There is only one coach, which is pushed up by the engine, and the ascent is so steep that it is not necessary to couple the two together. On both engine and coach there is a central buffer, which is curved to enable the two vehicles to negotiate bends easily.

Electric locomotives of Swiss make are used. There are four locomotives on the line, three of which are kept in service. P. H. McLauchlan (Rio de Janeiro).

Up the Great St. Bernard Pass

During a holiday in Switzerland I went by motor coach from Montreux to the top of the Great St. Bernard Pass, which is on the frontier between Switzerland and Italy. We left the Rhône Valley at Martigny, turned southward up the Val d'Entremont, and at once began the climb to the Pass. The Saurer coach in which I travelled is a splendid one of Swiss manufacture. It is specially designed for climbing, but soon after passing the highest village, the name of which is Bourg St. Pierre, we had to stop at a roadside cafe to let the engine cool.



The top of the Great St. Bernard Pass. The frontier post is in the foreground, and the hotel and Hospice can be seen across the Lake. Photograph by F. R. Chappell, Blandford.

On again, up a steep zig-zag road with hair-pin bends, on which we stopped once to look back down the valley and admire the snow-capped Grand Combin and other peaks. Eventually we reached the top of the Pass, where there are the Hospice, an hotel and the Swiss and Italian frontier posts. Looking down, we could see patches of snow far beneath us. Grass was to be seen here and there, but the scenery consisted chiefly of bare rocky slopes. Near the summit of the Pass I noticed an old cobbled road, and learnt that this had been used by the Romans, and also by Napoleon and his troops during his famous march across the Alps. The surface was still in quite good condition.

We ate our lunch sitting on a stone wall looking down on the cold dark lake, with the Italian frontier post on one side, and the enclosure containing the St. Bernard dogs of the Hospice on the other. The dogs walked up and down in a stately manner and were evidently used to visitors.

Later we went along to the Hospice, where we were conducted over the little chapel, and also the monks' museum, which contains many grim relics and historical records of the rescue work of the monks in the snow. The monks I saw were young and cleanshaven, and wore long, thick, black cloaks, wide black hats and strong boots. They looked very fit and agile, and I could well appreciate their fame as rescuers.

We were disappointed at the small amount of snow near the Pass, but the severity of the climate was tragically proved a few days later when we read in a newspaper that the monks of St. Bernard and their dogs had discovered two Italian smugglers frozen to death near the spot where we had lunched.

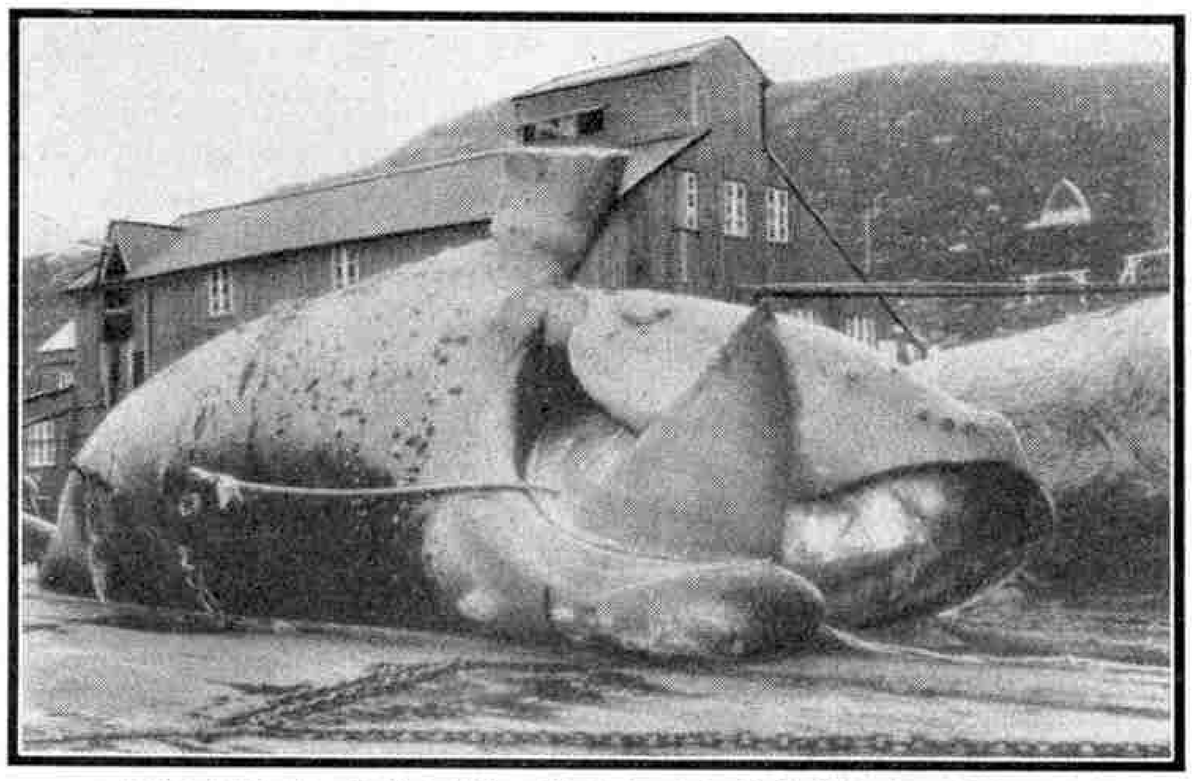
F. R. Chappell (Blandford).

Chasing a Whale

Last summer I spent a few days on a whale chaser, and as I had never before seen a large whale this proved a thrilling experience. We left port late at night, and at 4 a.m. a sailor went up into the crow's nest to look out for whales. At about 10 a.m. a shout announced that one had been sighted, and the master went forward to the platform in the bows on which stood the harpoon gun.

The vessel was carefully manœuvred into a suitable position for firing, and after about an hour we got within 35 yds. of the monster, which was crossing our bows. The master aimed the gun and then fired. The deadly harpoon shot towards its target, and there was a loud bang as the bomb fixed on its head hit the whale and exploded. Instantly the whale-rope attached to the harpoon commenced to run out at a great rate as the whale dashed away, and our small craft was dragged along after it.

Suddenly the rope slackened and the monster came to the surface about 250 yds. away for air, blowing great spouts of water. Then it dived and away went the rope again. It was not until another 100 yds. had been drawn out that it came up once more for air. By this time the whale had pulled out 500 yds. of rope and the steam winch therefore was started up, and the slack rope wound in. A small boat was launched and boarded by two oarsmen and the mate, who was armed with a spear 15 ft. long. They rowed away in the direction of the whale, and on getting at close quarters awaited a favourable opportunity to despatch it.



A fine catch at a whaling station. Photograph by R. G. Robertson, Balerno.

The whale rolled over and began to sink. If it had sunk too deep it would probably have been lost, so the winches were set going at full speed and the vessel steamed slowly astern. In about an hour's time the monster was drawn alongside, where it was shackled by the tail, and found to be a "Nordcaper," worth about £350. Before returning to port we caught also a fine bull "Finner" whale and a rare "Sperm" whale.

The "Nordcaper" whale that we caught had a "bonnet" or series of horny honeycombed prominences on its head. These are believed to have been created by the whale scraping its nose against rocks to get rid of barnacles and other shell-fish. When attacked he makes a fierce fight for life.

R. G. Robertson (Balerno).

In Search of New Models

Sports and Racing Cars

EVERY boy revels in the achievements of the speed kings of the motor racing world. The fascination of these is due not only to the high speeds reached, and to the thrills and excitement of the races. For much of it indeed the cars themselves are responsible. They are wonderful examples of modern motor engineering, and it is only natural therefore that racing cars and sports cars generally should be favourite subjects with model-builders all over the world. Many models of these types of car have been described and illustrated in the "*M.M.*", but Meccano enthusiasts are always on the lookout for more subjects of this kind, which provide endless material for model-building of the most fascinating kind.

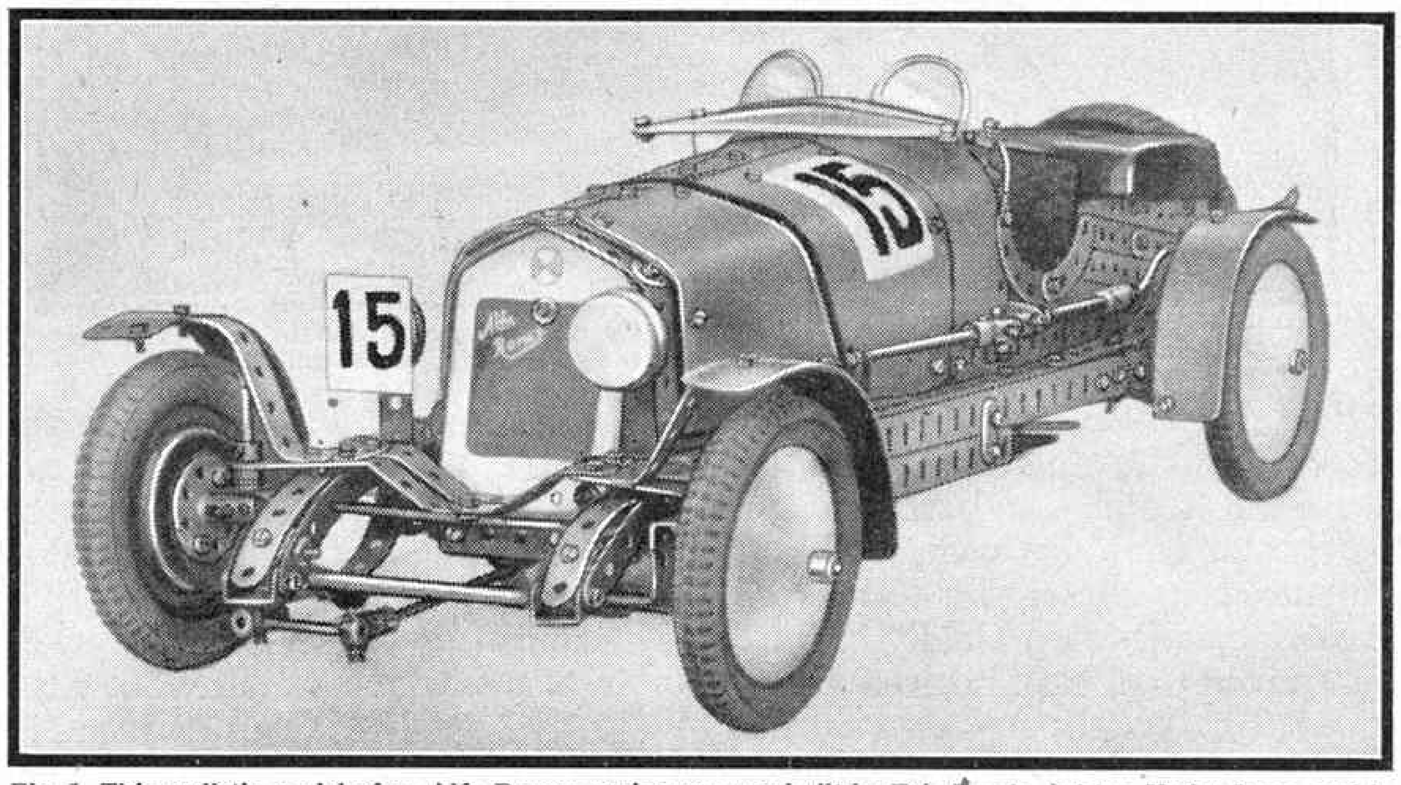


Fig. 1. This realistic model of an Alfa-Romeo racing car was built by Eric Leech, Ashton-Under-Lyne, and is constructed mainly from Meccano parts. The body is made of cardboard.

How any particular kind of motor car should be made of course depends on the stock of parts available. Owners of small Outfits will find it best to build the body and chassis as one unit, and it will probably be necessary to omit certain parts of the mechanism, such as the gear-box and clutch. An example of a model sports car built in this manner is shown in Fig. 4. The Meccano *Magic* Motor and the No. 1 Clockwork Motor are very useful as power units in models of this type.

When larger Outfits are available, the chassis and body can be built separately, and most of the mechanical details of an actual car can be incorporated. A Meccano Electric Motor is the best power unit for a large model, and this usually can be mounted inside the bonnet. A housing of Flexible Plates and Strips can be employed to give a fair representation of the appearance of a petrol engine. If the bonnet is constructed so that one side of it can be raised, the realism of such a model is greatly increased.

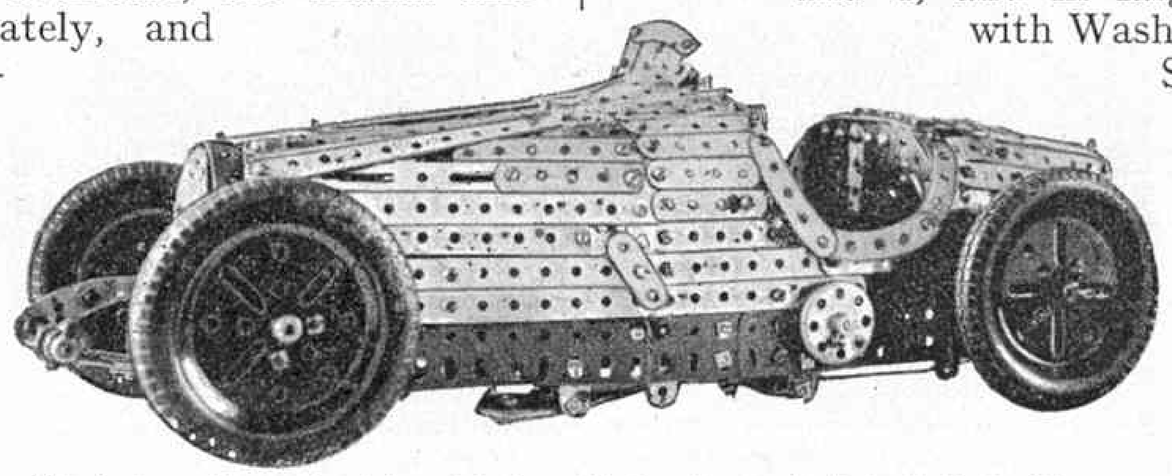


Fig. 2. A neatly constructed model of a midget racing car built by L. Paris, Orleans.

When Strips or Flexible Plates are used in building the body of a model, they should be bolted to a light framework and arranged so that very little bending or twisting is required. Flat Plates can be used in the construction of some styles of bodywork, and by skilful treatment very good results can be obtained, as is shown by the model illustrated in Fig. 4.

If a model under construction is to be used for racing against other miniature cars the bodywork should be as light as possible, and in this case it is permissible to use cardboard or stiff paper, as in the model shown in Fig. 1. The cardboard can easily be bent or cut to the required shape, with very pleasing results.

Much of the fun and interest in building a model motor car lies in the design and assembly of external details, such as lamps and bumpers, which help so greatly in giving a realistic appearance. In a small model two head lamps are sufficient, and for these, spot lights from a Meccano Lighting Set can be used. Alternatively, dummy lamps can be built up from 1″ Pulleys as in the model shown in Fig. 3. Larger models should include head, side and tail lamps, all of which can be wired up to small switches mounted on the dashboard, and a small dry battery can be concealed in the model to supply current.

Other accessories that add to the realism of a model sports car are dummy horns, exhaust pipes, spare wheels and filler caps on the petrol tanks. Exhaust pipes both on these and on racing cars can be represented by Rods or Crank Handles, as in the cars shown in Figs. 1 and 4, and in larger models by Rods fitted with Washers.

Special attention should be given to the radiator, which is a characteristic feature of every make of sports car, and every effort should be made to reproduce it as realistically as possible. A radiator of the grille type can be represented by Sprocket Chain wound around Rods secured to the bonnet, and Rods and Strips can be used effectively when modelling the moulded radiators found on the more recent sports cars. When cardboard is used for the bodywork, it can readily be adapted to the form of the radiator, and this can be made as realistic and correct in detail as possible. The Alfa-Romeo sports car model illustrated in Fig. 1 is a good example of this. In small models it is more difficult to reproduce the details of the radiator exactly, and for these the best plan is to use a plain surface such as a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate.

In the model of a typical small racing car shown in Fig. 2 the body is made of Strips, and a really good appearance is obtained without excessive bending or mutilation of the parts used. This type of body construction forms an interesting contrast with that used in the models in Figs. 1 and 4. The chassis of the racing car illustrated in Fig. 2 is built up of Angle Girders, and semi-elliptic springs are employed. Power is provided by an E6 Electric Motor, which is mounted under the bonnet, and drives the rear axle through a gear-box. A noteworthy feature is that the gear-box is mounted transversely in the chassis in order to save space. Internal expanding brakes are fitted on all four wheels, and are operated by hand and foot levers.

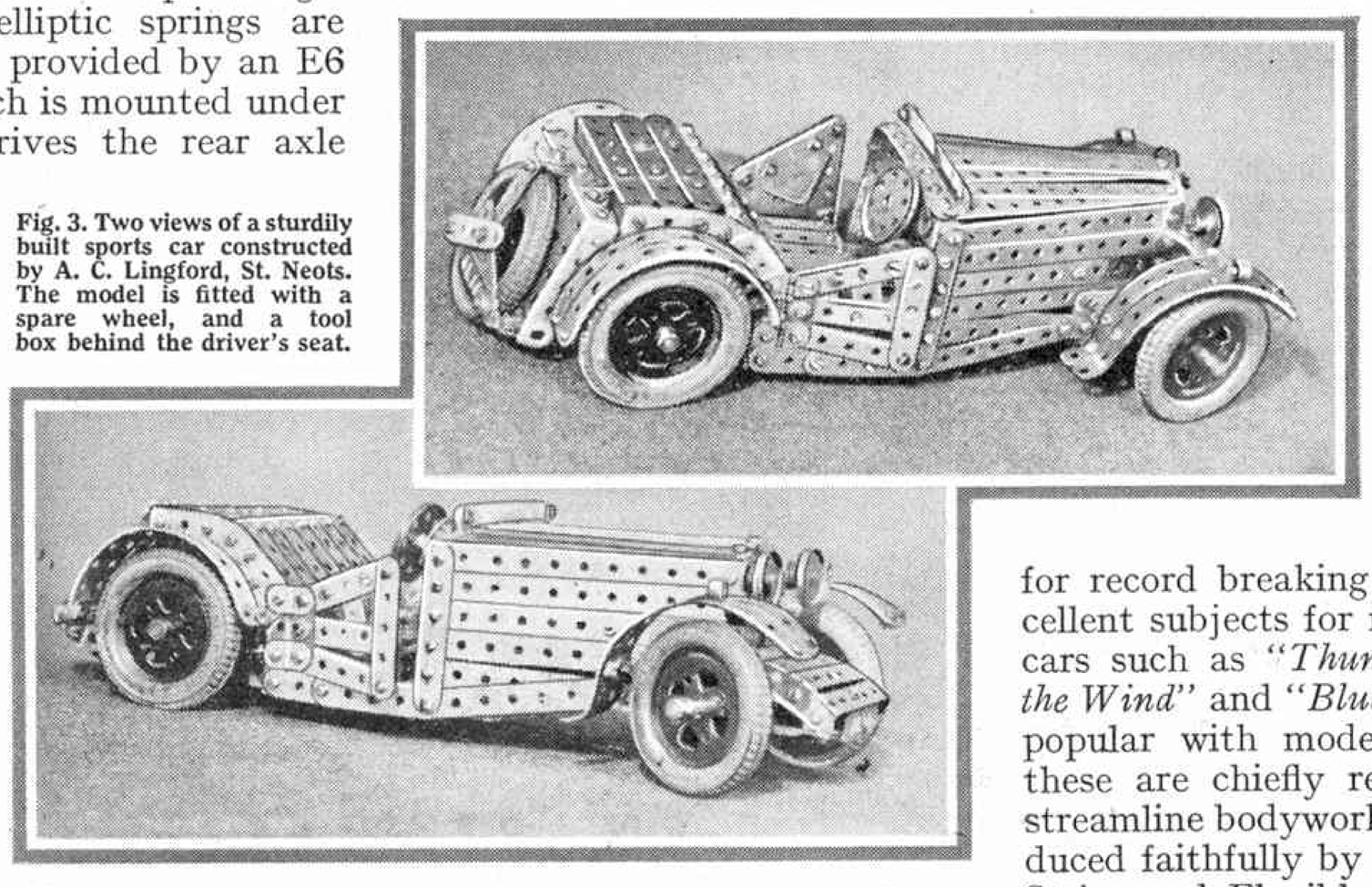


Fig. 3. Two views of a sturdily built sports car constructed by A. C. Lingford, St. Neots. The model is fitted with a spare wheel, and a tool box behind the driver's seat.

Semi-elliptic springs are easy to reproduce in Meccano. They consist of flat steel blades, or leaves as they are called, of different lengths, built up with the longest on top, and the shortest at the bottom. The leaves are shackled together at their centres, where the spring is fitted to the axle. On a Meccano model springs of this kind are easily built up from three or four Strips bolted together in the middle and curved upward slightly on each side of the bolt. The forward end of the spring is fastened securely to the chassis by Angle Brackets and the rear end is attached by means of a shackle or pivot. The shackle can be constructed from two Double Brackets, one of which is bolted to the spring and the other to the chassis, the two being coupled together by a short Rod.

A less common type of spring is the quarter elliptic, used occasionally for mounting rear axles. As its name suggests, this can be described as a semi-elliptic spring cut in half, and a similar construction to that of the latter can be followed in building it in Meccano. One end of the spring is fastened to the chassis, and the other end to the axle.

Independent wheel suspension, in which each wheel has a separate spring, is now the most popular form of springing for racing and sports cars. The advantage of this system is that one wheel can be raised vertically when passing over a bump without affecting the others, so that the equilibrium of the car is not disturbed. In a model, this type of suspension can be achieved by mounting each wheel at the end of a hinged Rod or a pair of Rods, so that it can move up or down. One end of a Compression Spring is connected to the arm so that when the wheel moves vertically the spring is compressed. In some cases a torsion bar is provided to bring the wheel back to its correct position, and those who wish to incorporate this feature in a car model will find good examples in "*Suggestions Section*" of the issues of the "*M.M.*" for October 1937 and February 1937.

There are several forms of steering gear that can be used on model cars, and so many good examples in Meccano have been described that model-builders will have no difficulty with this important mechanism. A steering gear suitable for small racing and sports cars was described on page 423 of the July 1937 "*M.M.*," in which it is shown fitted to a three-wheeled sports car.

The giant specially built cars used for record breaking attempts form excellent subjects for models, and famous cars such as "*Thunderbolt*," "*Speed of the Wind*" and "*Bluebird*" are especially popular with model-builders. Most of these are chiefly remarkable for their streamline bodywork. This can be reproduced faithfully by the judicious use of Strips and Flexible Plates, while cardboard also can be employed in the manner already suggested.

It is important when building a model of this type to plan the work from the beginning in order to ensure that the model is not constructed to a scale too big for the range of parts available. A small well-proportioned model is much more satisfying than a large one that is skimped in its details owing to shortage of parts.

A type of sports car that is equally suitable for reproduction in Meccano is the three-wheeler or tri-car. Some of these are fitted with one wheel in front and two behind, while in others, such as the Morgan, this arrangement is reversed. Most three-wheeled sports cars have two-cylinder air or water-cooled engines, which in many cases are mounted in front of the bonnet. The representation of these in Meccano is interesting. Air-cooled cylinders can be represented by several loose Pulleys secured on a Rod, while a Sleeve Piece or Cylinder (Part No. 216) will serve very well as a water-cooled cylinder. A model three-wheeled sports car chassis of the Morgan type was illustrated on page 227 of the April 1937 "*M.M.*," and it is easy to fit this with a body constructed from Strips and Flexible Plates.

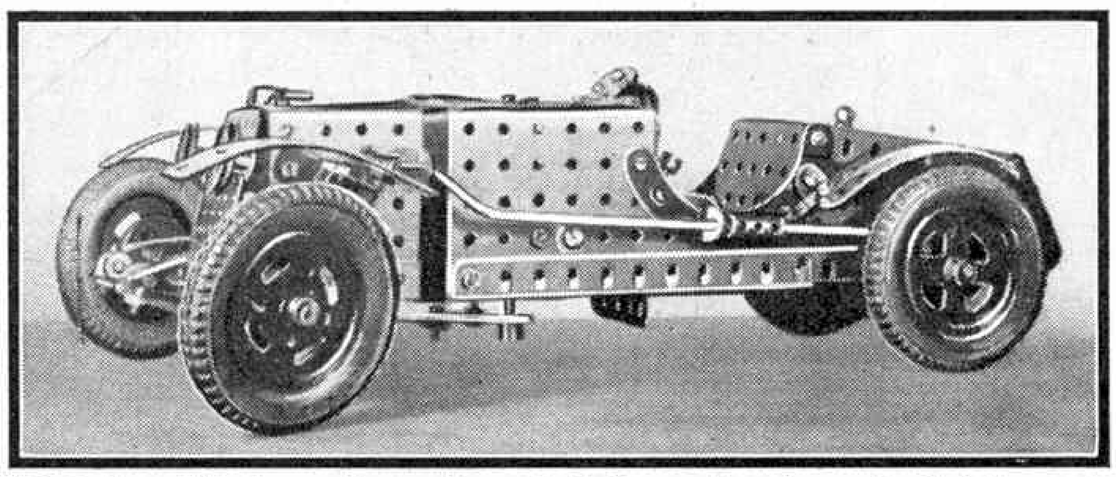


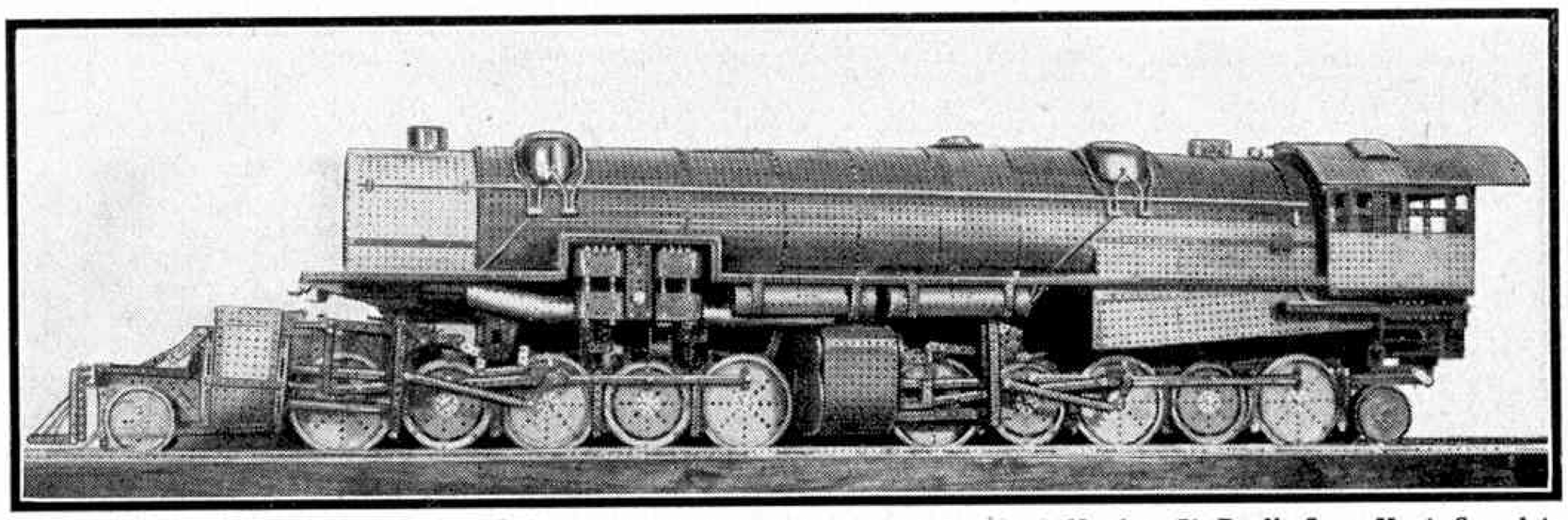
Fig. 4. A realistic two-seater sports car built from only a few parts. It is the work of Sydney Smith, Edinburgh.

Model-builders on the lookout for more novel and intricate subjects will find it a good idea to try their skill in reproducing a car fitted with front wheel drive, which is claimed to give better road holding qualities than the customary rear wheel drive. There are several methods by means of which the drive can be transferred to the front wheels of a model. One of these employs universally jointed Rods, while in another gearing is used. The latter method usually is the more satisfactory.

A Model "Mallet" Locomotive

Powerful American Engine in Meccano

LOCOMOTIVES make splendid subjects for model-building, and there are many Meccano enthusiasts who confine their activities almost entirely to work of this kind. These not only build miniatures of famous modern locomotives of the usual kind, but also of many rarer types, with features of outstanding interest that are well reproduced in Meccano. A particularly good example of such a model is shown in the illustrations on this page. It represents a 2–10–10–2 "Mallet" locomotive constructed for the Virginian Railroad in the United States, in 1918, and was built by Mr. J. Nowlan, St. Paul's Cray, Kent, who has been a Meccano enthusiast since his early boyhood. Its construction occupied his leisure hours for many months. The prototype of his model has a tractive effort of 176,600 lb. and is one of the largest and most powerful ever built, being designed for use as a banking engine for trains worked over difficult gradients.

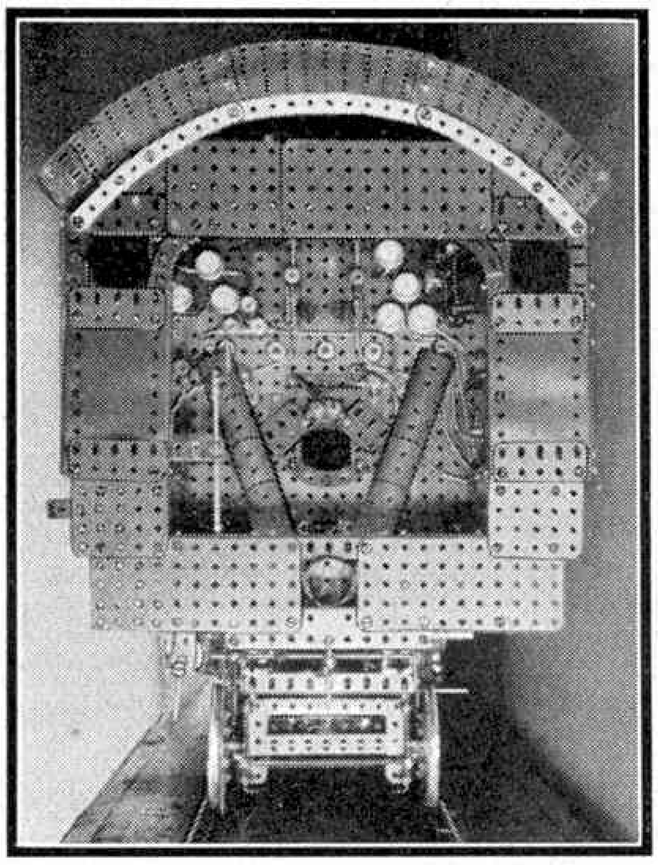


A fine model of a 2-10-10-2 "Mallet" locomotive, built from Meccano parts by Mr. J. Nowlan, St. Paul's Cray, Kent. Complete with tender the model is 10 ft. 9 in. in length, and it incorporates a large number of interesting details.

The outstanding feature of the original "Mallet" design is the use of two power units, each with its own frames, cylinders and driving wheels. There is a single large boiler, which is built up over the rear driving unit, as in an ordinary locomotive, but extends forward over the leading one, which forms a pivoted truck that is free to move sideways relatively to the boiler. This allows the engine to run easily round curves, in spite of its immense length.

The design lends itself well to the construction of very large and powerful locomotives for hauling immense loads, where high speeds are not required, and the Virginian Railroad "Mallet" once hauled a train of coal wagons with a total weight of 15,400 tons. "Mallets" with three driving units, known as triplexes, also have been built in order to give as great adhesion as possible. Triplexes built for the Erie and Virginian Railroads have as many as 24 coupled wheels, and in a trial an Erie triplex hauled a coal train over $1\frac{1}{8}$ miles in length and weighing over 16,000 tons.

Mr. Nowlan's model is built to a scale of $1\frac{3}{16}$ in. to 1 ft., and its overall length complete with tender, which is not shown in the illustrations, is 10 ft. 9 in. The model was built from scale drawings of the actual locomotive and follows as closely as possible the construction of its prototype. The frames are strongly constructed of Angle Girders and Flat Girders, and are fitted with leaf springs and equalising gear. The front frame unit carries three sliding saddles, which are bolted to the underside of the boiler. These allow the front unit to swing when the locomotive is negotiating a curve. The low-pressure cylinders on the front unit are built as separate units and consist of Circular Girders joined by $4\frac{1}{2}$" Strips.



The cab and its fittings provide examples of Meccano construction of the highest order.

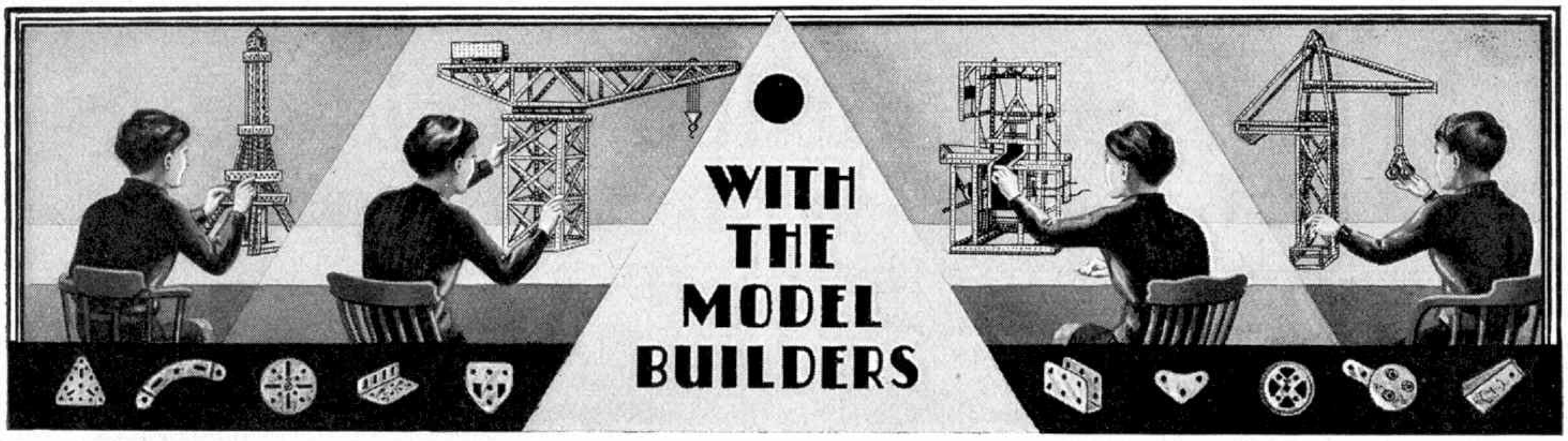
The high pressure cylinders are built as one complete unit and are fitted across the rear frame. The cylinder ends are Circular Plates, and the valve chest ends are Face Plates fitted with Wheel Flanges. Correct Walschaerts valve gear is fitted to both high and low pressure cylinders and is well reproduced with Strips and Cranks.

The boiler has a length of 5 ft. 4 in., and its barrel tapers from $12\frac{1}{2}$" to $10\frac{1}{2}$" in diameter. It is built up from Strips and has a very massive appearance. The steam pipes leading from the boiler to the high pressure cylinders and from the latter to the low pressure cylinders are made from Boilers.

The cab of the locomotive contains a large amount of interesting and cleverly designed detail work, and is equipped with seats for the driver and fireman as in the actual locomotive. On the left-hand side of the cab, where the fireman sits, are placed the controls of the mechanical stoker and coal distributors. Excellent use is made of glass microscope slides for glazing the windows, and realistic pressure gauges and indicators are made by fitting inscribed cardboard discs in $\frac{3}{4}$" Flanged Wheels, and covering them with discs of celluloid. Steam cocks are made by passing $\frac{3}{4}$" Bolts through the threaded holes of Couplings, and then fitting the end of each bolt with a $\frac{1}{2}$" or $\frac{3}{4}$" Pinion to represent a hand-wheel.

The fire-box is fitted with a mechanical stoker which is operated by an engine placed under the front of the cab. The engine consists of a steam cylinder and a piston that drives a rack to and fro, the latter rotating Ratchet Wheels that in turn operate the stoker.

The tender is 3 ft. long and is built up from Plates and Angle Girders stiffened internally by cross-braces. Its wheels are Circular Plates fitted with tin lids for flanges.



POWERFUL MECCANO ARC LAMP FOR MEDICAL TREATMENT

From time to time I have described in the "*M.M.*" various applications of Meccano parts in the construction of scientific apparatus that can be put to practical use. This month I am able to illustrate and describe another fine example of this kind that has recently been brought to my notice. This time it is a powerful arc lamp for use in medical remedial treatment, which has been built mainly from standard Meccano parts by Dr. Axel Saugman, Odense, Denmark. The lamp, which is shown in the illustration on this page is in constant use at the Light Therapy Clinic of the City and Council Hospital, Odense, where it is proving of great assistance in the treatment of tuberculosis of the skin.

The lamp works on three-phase alternating current of from 70 to 100 amp., and the powerful arc is generated between the pointed ends of six special carbons, which are arranged in radial formation like the spokes of a wheel, as shown in the illustration. Two of the carbons are nickel-cored and the remaining four have cores made of a material known as monazite. The carbons are mounted in a strong framework of Angle Girders, in such a manner that on turning the handwheels provided, their inner ends can be brought into contact to strike the arc and then withdrawn to adjust the flame to the required intensity. When the lamp is in action the patient is protected from the great heat produced by the arc by a bowl-shaped shield, which is constructed with hollow glass walls, through which cold water is circulated at a rate of six gallons per minute.

The stand carrying the frame for the carbons also is built from Angle Girders, and it is mounted on a Meccano Roller Bearing so that it can be swivelled to direct the rays from the arc in the required direction.

The lamp is fulfilling the purpose for which it is designed very successfully, and recently was exhibited to a gathering of medical men and scientists, who were very enthusiastic over its possibilities. Factory made lamps of a similar kind are now being produced in Denmark.

A SIMPLE REVERSING GEAR FOR SMALL MODELS

Model-builders who do not possess any Pinions or Gear Wheels will be interested in the gearless reversing mechanism described here. This mechanism can be used in any model driven by a non-reversing Motor, and it provides also a satisfactory substitute for right angle gearing necessitating the use of Bevel Gears.

The shaft of the model to be driven is so mounted in its bearings that it is free to move endways through a distance of about 1 in., and two Road Wheels are fixed to it about 2" apart.

The driving shaft of the Motor is coupled by a Driving Band to a second Rod that carries at one end a 1" Pulley fitted with a Rubber Ring. The Pulley is arranged on the Rod so that it projects between the two Road Wheels. The shaft of the model then can be rotated in either direction simply by sliding the Rod so as to bring one or the other of its Road Wheels into contact with the tyre of the 1" Pulley. A Strip fastened by a Collar to the slideable Rod and pivoted at its centre is used as an operating lever to slide the Rod to and fro.

For incorporation in very small models the mechanism can be reduced in size by using a ½" Pulley and two Bush Wheels as the friction wheels. To give the ½" Pulley a good grip, it can be fitted with a tyre from a Dinky Toys Motor Vehicle, if one of these is available.

MECCANO GADGETS FOR CYCLISTS AND CAMPERS

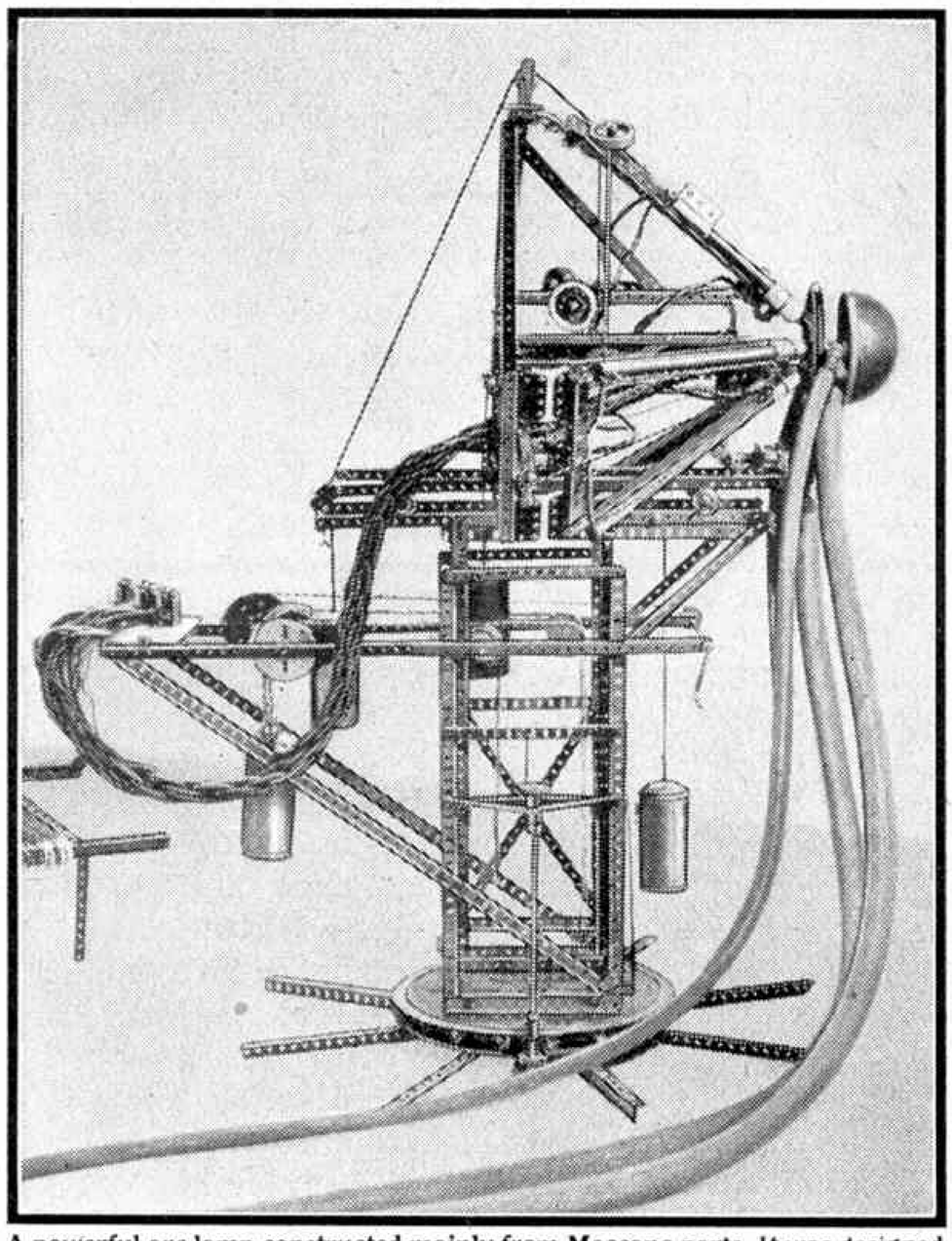
Model-builders now planning cycling holidays and week-end trips will be interested in the following details of various "gadgets" made with the aid of Meccano parts that will prove useful additions to their camping equipment.

One of these is suggested by N. Ridge, Oldham. Most cyclists carry the greater part of their camping gear in packs on their backs, but Ridge prefers to load all his gear on his machine, thus allowing himself free movement. For this purpose he made two light but strong frames from Angle Girders and Strips, and securely bolted them to the carrier and rear forks of his bicycle. These frames support two haversacks, arranged one on each side of the rear wheel. The framework adds little dead weight to the machine and leaves plenty of room on the carrier for a tent and tent poles.

J. Farr, Middlesbrough, has submitted a scheme for a clamp to hold a pocket watch on the handlebars of his bicycle. The device consists of a circle of 2½" Crank Curved Strips fitted with Double Brackets to grip the watch, the Curved Strips being attached to the handlebars by a bracket made from Strips. The watch is protected from damage due to road shocks by a piece of Kemex Rubber Tubing, which is split along its length and is fitted around the case of the watch and also around the inside of the Double Brackets.

A useful item of camp equipment that can easily be made from Meccano parts is a folding seat designed by B. Yates, Belfast. The framework of the seat is made from 12½" Strips, two pairs of which are pivoted at their centres on a Rod while their free ends are joined by Rods. The end of a strip of canvas about 6" wide is passed round one of the lower Rods of the frame and stitched to hold it in position. The strip is then passed around the outside of the upper Rods and the other lower Rod, thus enclosing the frame on three of its sides. To each of the lower Rods a 7½" Strip is also fastened by a Crank. When the seat has been erected these Strips are bolted together so that they brace the frame. The seat can be folded up into a small space by withdrawing the bolt from the tensioning Strips.

One of the most necessary items of camping equipment is a reliable means of cooking. Petrol and methylated spirit stoves can be used for supplying the heat, but a small portable oven is rather expensive. A good substitute can be made at very little cost in a manner suggested by G. Gardner, Southport. He uses a large biscuit tin, which he cuts up into square sheets with a pair of tin shears. Angle Girders are then secured to the sides of each sheet so that they can be quickly bolted together, and the lid of the box is hinged to one of the sides by a pair of Meccano hinges. When disassembled, the sheets can be packed into a flat parcel, which takes up little room and can be strapped to the carrier of a bicycle.



A powerful arc lamp constructed mainly from Meccano parts. It was designed and built by Dr. Axel Saugman, Odense, Denmark, and has been used with great success in the treatment of skin tuberculosis.

A WARNING DEVICE FOR CLOCKWORK MOTORS

J. Dobson, Plymouth, recently sent me details of a Meccano clock fitted with a novel device designed to give audible warning when the spring of the Clockwork Motor operating it is almost run down. The warning mechanism consists of a 6 B.A. Bolt fastened inside the casing of the Motor by an Angle Bracket, but insulated from the Angle Bracket by Insulating Washers. The Bolt and the Motor are wired up in an electric circuit, which includes also an electric bell. As the spring unwinds and just before it is completely run down, it makes contact with the point of the 6 B.A. Bolt and closes the electric circuit, when the bell continues to ring until the Motor is rewound.

MINIATURE TYRED WHEELS FOR SIMPLICITY MODELS

The construction of "simplicity" models is a very attractive branch of Meccano model-building owing to the fascination of selecting the most suitable parts for representing the prototype. When building models of this kind the need often arises for miniature tyred wheels. D. Hurden, Harefield, uses tyres removed from Dinky Toys Motor Cars. He fits these on to Collars and finds them very serviceable and realistic. The grubscrews in the Collars are removed and replaced by 5/64" Grub Screws (part No. 69c).

A slightly larger wheel can be built up with a ½" Pulley and a tyre from a Dinky Toys Racing Car, but the appearance is not so realistic as when Collars are used.

AUTOMATIC GRADIENT BRAKE

B. Reeves, Stockport, constructed recently a model motor car to which he fitted a mechanism that automatically applies the brakes when the car is travelling downhill. The mechanism is operated by a pendulum, consisting of two Flanged Wheels fixed on the end of a Rod. This is mounted inside the bonnet. When the car runs on to a falling gradient, the pendulum swings over in relation to the plane of the chassis and engages a contact fitted to the side of the bonnet, so closing an electric circuit, which operates a solenoid brake on the back axle.

The brake is of the contracting band type and is not sufficiently powerful to stop the car, but only slows it down. When the car travels down a very steep hill, however, the pendulum swings over still farther and engages a second contact, thus closing another circuit that brings a more powerful solenoid brake into action. An automatic brake of this kind adds greatly to the interest of a model car and I congratulate Reeves on his ingenuity.

SUGGESTED NEW AEROPLANE CONSTRUCTOR PARTS

(Reply to J. Swepstone, Newbury, and others.)

Several interesting ideas for new Aeroplane Constructor Parts have been put forward recently by enthusiastic model-builders. The parts suggested include a Lewis gun, fitted to a swivel ring, a fixed Vickers gun and an aerial torpedo for use with models of military aeroplanes, and a pair of skis for models of civil machines. These parts would certainly increase the realism of Aeroplane Constructor models, and they will receive full consideration when additions to the range are being planned. In the meantime, however, model-builders can use Meccano parts quite successfully for reproducing these accessories.

New Outfit Models

A Tricycle and a Fine Double-Decker Bus

THE models described this month are designed to provide interesting subjects for both small and large Outfits. They include a simple tricycle built from Outfit No. O, a novel portable garage crane that can be built from the contents of Outfit No. 2, a No. 4 Outfit steam river tug, and a realistic double-decker bus that makes good use of the parts in Outfit No. 7. All are easily built, and will provide really good fun both in building and operation.

The tricycle is illustrated in Fig. 3, and is very easy to assemble. First, the short crossbar is built by bolting three Flat Brackets together in the manner shown. These are then bolted to the Flat Trunnion that forms the saddle, the bolt holding also two Trunnions that in turn are attached to a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip by means of an Angle Bracket. The Double Angle Strip provides bearings for the $3\frac{1}{2}''$ Rod that forms the rear axle.

The front fork consists of two $2\frac{1}{2}''$ Strips joined by two Angle Brackets. The $\frac{3}{8}''$ Bolt joining the latter parts is first slipped through the Flat Bracket of the crossbar, and then a nut is screwed on its shank. After passing the Bolt through the holes in the Angle Brackets, a second nut is placed on it and the $2\frac{1}{2}''$ Curved Strip representing the handlebars is then bolted to one of the Angle Brackets. The front wheel, a Bush Wheel, is carried on the shank of two bolts passed through the $2\frac{1}{2}''$ Strips that form the forks, and two washers are used to prevent it from rubbing against the Strips.

Parts required to build the model tricycle: 2 of No. 5; 3 of No. 10; 4 of No. 12; 1 of No. 16; 2 of No. 22; 1 of No. 24; 11 of No. 37; 2 of No. 37a; 2 of No. 38; 1 of No. 48a; 1 of No. 90a; 1 of No. 111c; 2 of No. 126; 1 of No. 126a; 2 of No. 155a.

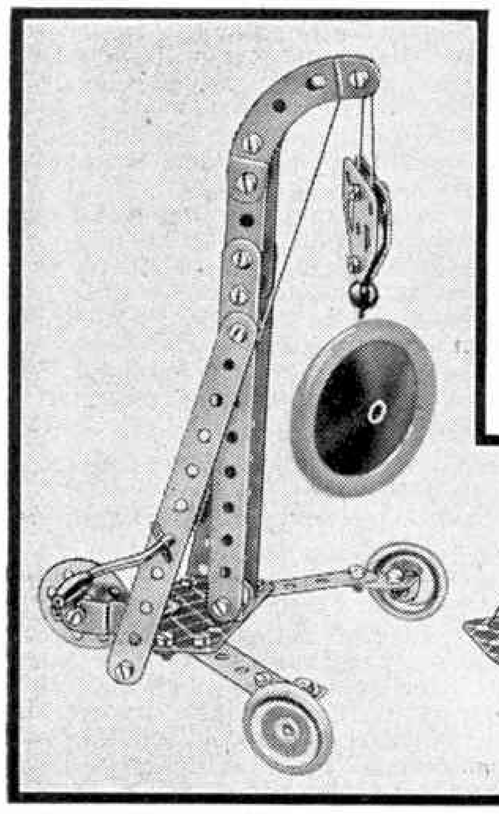


Fig. 2. This simple model represents a portable crane of the type used in motor garages. It can be built with Outfit No. 2.

In building the portable garage crane shown in Fig. 2 it is best to commence with the base. This consists of a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate bolted to a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. Two $2\frac{1}{2}''$ Strips are bolted to the free corners of the Flexible Plate, each $2\frac{1}{2}''$ Strip being extended by a Flat Bracket, and to the Flat Brackets are bolted Angle Brackets to carry 1" Pulleys fitted with Rubber Rings. The rear wheel is a Bush Wheel mounted on bolts held in a Cranked Bent Strip that is attached by an Angle Bracket to the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate. The jib post is composed of $5\frac{1}{2}''$ Strips extended three holes by $2\frac{1}{2}''$ Strips. Curved Strips are bolted to the latter and are joined by a lock-nutted $\frac{3}{8}''$ Bolt.

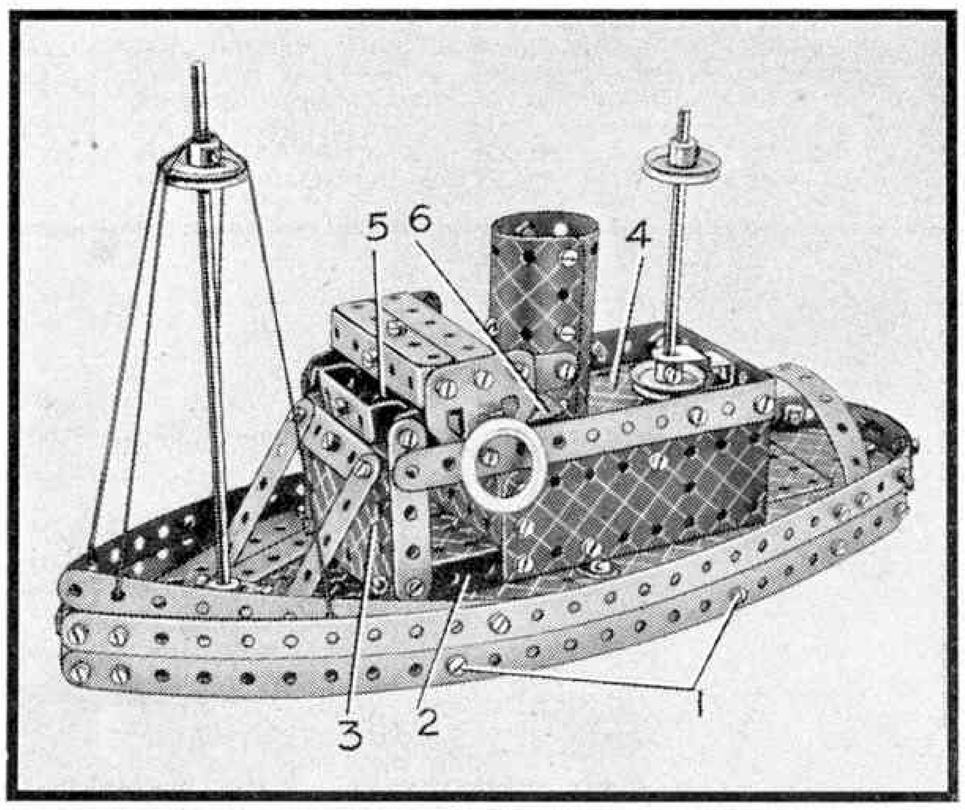


Fig. 1. A sturdy model of a steam tug, which can be built with the parts contained in Outfit No. 4.

The stays for the jib post are $5\frac{1}{2}''$ Strips, which are bolted to the Double Angle Strip of the base and to the $5\frac{1}{2}''$ Strips of the jib. The pulley block is made from two Flat Trunnions, the broad ends of which are spaced apart by three washers. The narrow ends of the Flat Trunnions carry a small Loaded Hook. The hoisting cord is tied to the $\frac{3}{8}''$ Bolt at the jib head and is led through the pulley block. It is then taken back over the $\frac{3}{8}''$ Bolt and wound around the Crank Handle journalled in the stays.

The small bogie is made from a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, bearings for the wheel axle being provided by two Trunnions. The drawbar consists of $2\frac{1}{2}''$ Strips joined to the Flexible Plate by Angle Brackets.

Parts required to build the model portable crane: 4 of No. 2; 6 of No. 5; 3 of No. 10; 8 of No. 12; 2 of No. 17; 1 of No. 19g; 4 of No. 22; 1 of No. 24; 4 of No. 35; 32 of No. 37; 3 of No. 37a; 4 of No. 38; 1 of No. 40; 1 of No. 44; 1 of No. 48a; 1 of No. 57c; 2 of No. 90a; 4 of No. 111c; 2 of No. 126; 2 of No. 126a; 4 of No. 155a; 1 of No. 176; 1 of No. 187; 2 of No. 188.

The steam tug shown in Fig. 1 is a particularly good example of the interesting work that can be done with a No. 4 Outfit and is simple to build. The sides of the hull consist of two pairs of $12\frac{1}{2}''$ Strips, which are joined at the bows by Angle Brackets and at the stern by pairs of Formed Slotted Strips that overlap each other by half their length. The $12\frac{1}{2}''$ Strips of each pair forming the sides are connected to each other by two Flat Brackets. The Bolts 1 hold Angle Brackets, to which is attached a Hinged Flat Plate that forms the deck. The Plate is extended by Flanged Sector Plates. At the bows the spaces between the Sector Plate and the hull are closed with $3\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips, and the stern is made with $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and a Semi-Circular Plate.

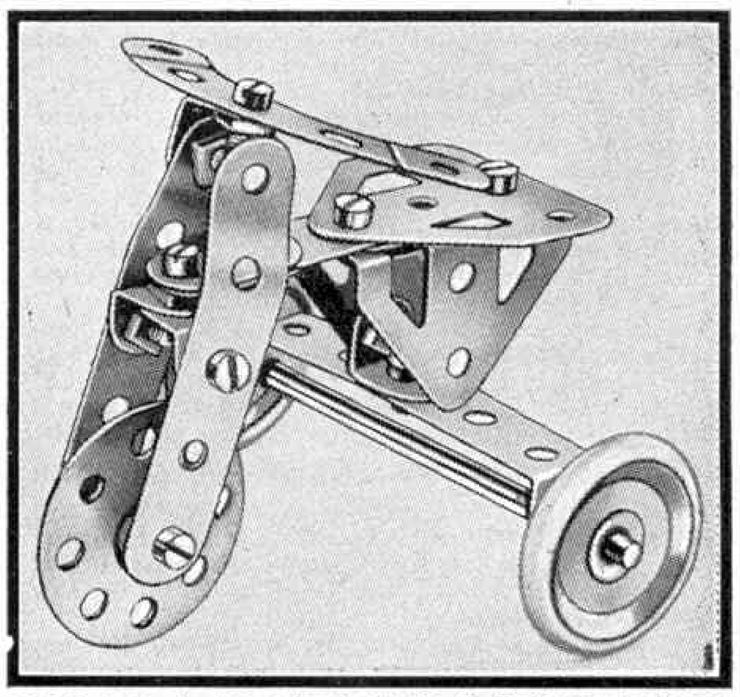


Fig. 3. A good subject for Outfit No. O. This tricycle is easy to assemble and can be steered by the handlebars.

The deck-house and bridge are assembled as a separate unit on a base consisting of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 2, to the flanges of which are bolted two $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates and a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 3. The Plate 3 is bent as shown, and to it is attached the $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 4 that forms the roof of the deck-house. This Plate is supported by an Angle Bracket and a Double Angle Strip. Rails for the deck-house roof are made from $5\frac{1}{2}''$ Strips. The bridge is formed by a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 5 and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate 6, to which a $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip is attached by means of an Angle Bracket.

The wheel-house consists of two Flat Trunnions joined by three Double Angle Strips and a $2\frac{1}{2}''$ Strip. The funnel comprises a U-Section Curved Plate, a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate and a $2\frac{1}{2}''$ Strip, all bolted together as shown in Fig. 1, the complete unit being attached to the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate 6 of the bridge by a Reversed Angle Bracket and an Angle Bracket. The aft mast is a 4″ Rod fitted with two 1″ Pulleys, and it is stepped in a Cranked Bent Strip. The completed deck-house and bridge unit is attached to the deck by two Angle Brackets.

The model is completed by fitting the forward mast, which consists of a 4″ and a 3″ Rod joined together by a Rod Connector. This mast is fixed in the boss of a Bush Wheel bolted to the deck.

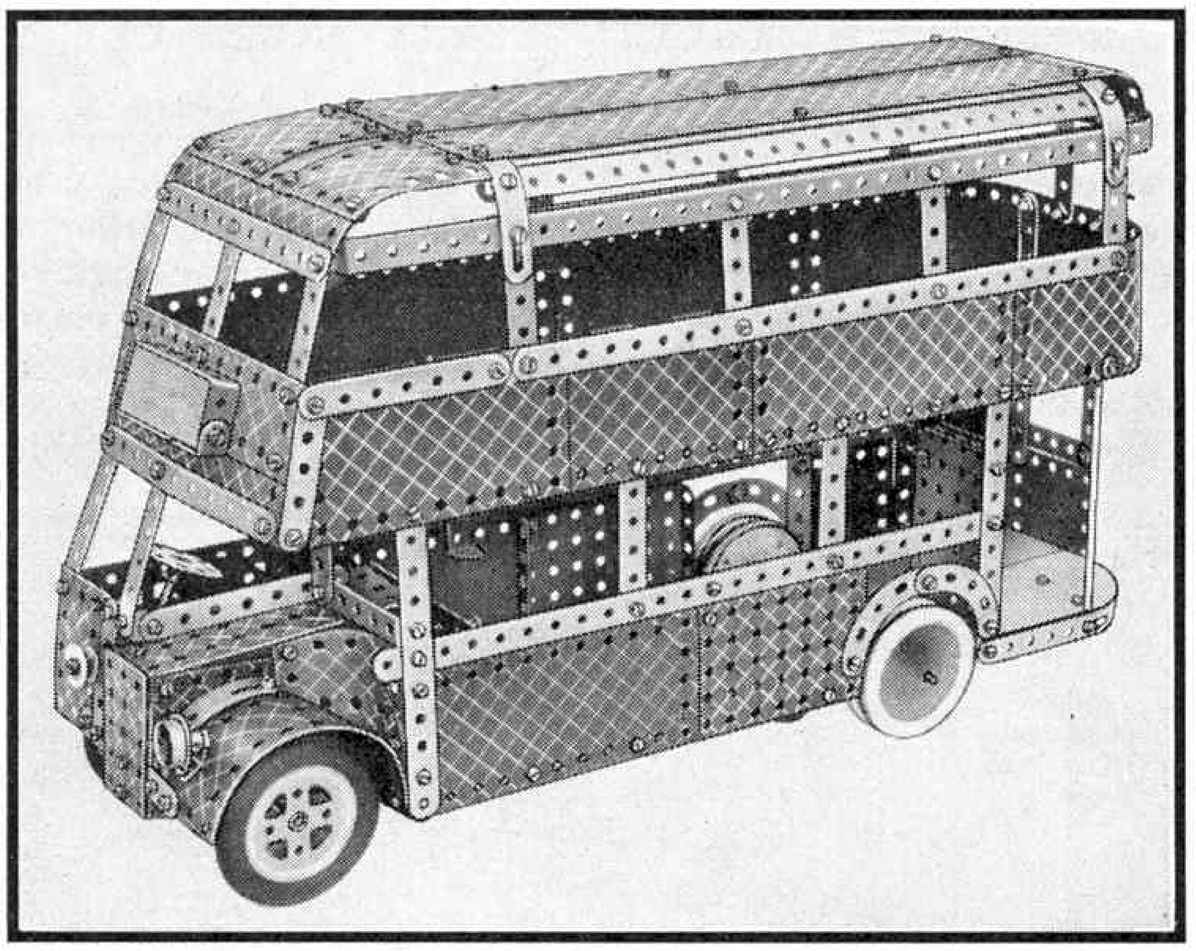


Fig. 4. A fine model of one of the latest types of double-decker buses. It is driven by an Electric Motor and forms an interesting subject for Outfit No. 7.

Parts required to build the model steam tug: 4 of No. 1; 6 of No. 2; 2 of No. 3; 9 of No. 5; 4 of No. 10; 2 of No. 11; 8 of No. 12; 4 of No. 12c; 2 of No. 15b; 1 of No. 16; 3 of No. 22; 1 of No. 24; 75 of No. 37; 6 of No. 37a; 6 of No. 38; 1 of No. 40; 1 of No. 44; 1 of No. 48; 6 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54a; 6 of No. 111c; 1 of No. 125; 2 of No. 126a; 2 of No. 155a; 2 of No. 188; 2 of No. 189; 3 of No. 190; 1 of No. 192; 1 of No. 198; 1 of No. 199; 1 of No. 213; 1 of No. 214; 4 of No. 215.

Our largest model this month is the fine working double-decker omnibus shown in Figs. 4 and 5. It is driven by an E120 Electric Motor, and its construction forms a pleasant pastime for owners of Outfit No. 7. The chassis is shown in Fig. 5. Two $12\frac{1}{2}''$ Angle Girders 1 are connected together at each end by a $5\frac{1}{2}''$ Strip, the bolts at one end being used to fix in position one flange of the Electric Motor 2, the other flange of the Motor being bolted to a Flanged Sector Plate 3.

The mechanism that transmits the drive to the rear axle is now fitted. This is accomplished by first bolting a Reversed Angle Bracket 4 to the chassis, the bolt carrying three washers on its shank for spacing purposes. The Bracket 4 forms a bearing for one end of the $11\frac{1}{2}''$ Rod 5, which is journalled also in the Double Angle Strips and Double Bent Strip forming the sides of the dummy differential casing. Rod 5 carries a Worm 6 that meshes with a $\frac{1}{2}''$ Pinion fastened on the $6\frac{1}{2}''$ Rod used for the rear axle. The differential casing is prevented from moving endways by Collars.

The radiator is a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate attached to Flanged Sector Plate 3 by an Angle Bracket, and it carries the second Flanged Sector Plate that forms the bonnet. A $3\frac{1}{2}''$ Strip is bolted across the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate and is used to support the mudguards. The near side of the bonnet is built up with a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate and two $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates, one of the latter being bolted to a Trunnion 7, shown in Fig. 5, while the other is curved round as shown in Fig. 4. The off side of the bonnet is built up to form the driver's cab.

The construction of the body is now commenced. Four Angle Brackets are bolted to the ends of the $5\frac{1}{2}''$ Strips of the chassis, and $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are bolted to the forward pair. To these Plates $5\frac{1}{2}''$ Strips are bolted, which in turn are attached to the horizontal $12\frac{1}{2}''$ Strips. The $5\frac{1}{2}''$ Strips form the window sashes, and their lower ends carry also the remaining Plates that form the sides of the bus.

Angle Girders 9 extended by $12\frac{1}{2}''$ Strips form the main members of the upper deck, and a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate 8 is bolted in position to provide a roof for the driver's cab. The Plates enclosing the upper deck are now added. Plate 10 is half of a Hinged Flat Plate from which the centre pin has been removed. The other half of the Plate is used in a similar position on the opposite side of the model. The sides are connected at the front by $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plates and Angle Brackets. Strip 11 is a compound strip made by overlapping two $5\frac{1}{2}''$ Strips six holes.

The roof is constructed as shown in Fig. 4. It consists of $12\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates extended by Flexible Plates of various sizes, the whole being strengthened with Angle Girders. This assembly is extended at each side by $12\frac{1}{2}''$ Strips and Angle Girders bolted to Formed Slotted Strips, and is then fixed to the window sashes of the upper deck.

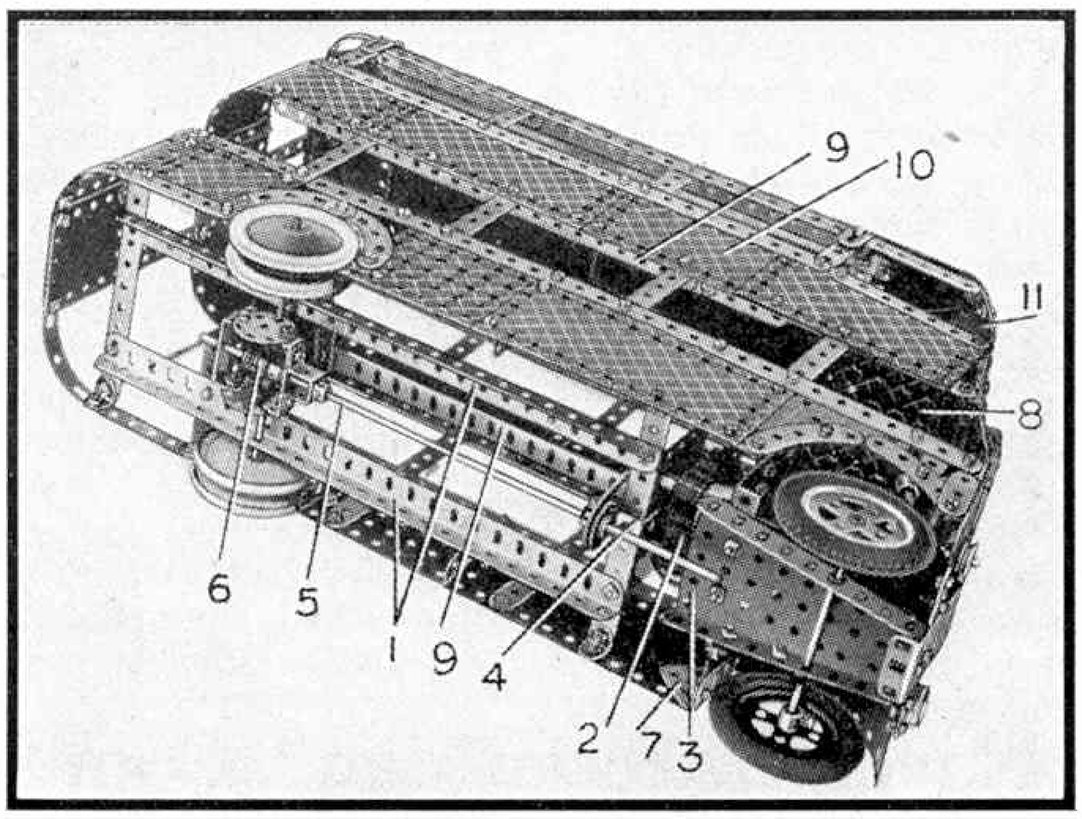


Fig. 5. An underneath view of the omnibus illustrated in Fig. 4, showing details of the chassis and driving mechanism.

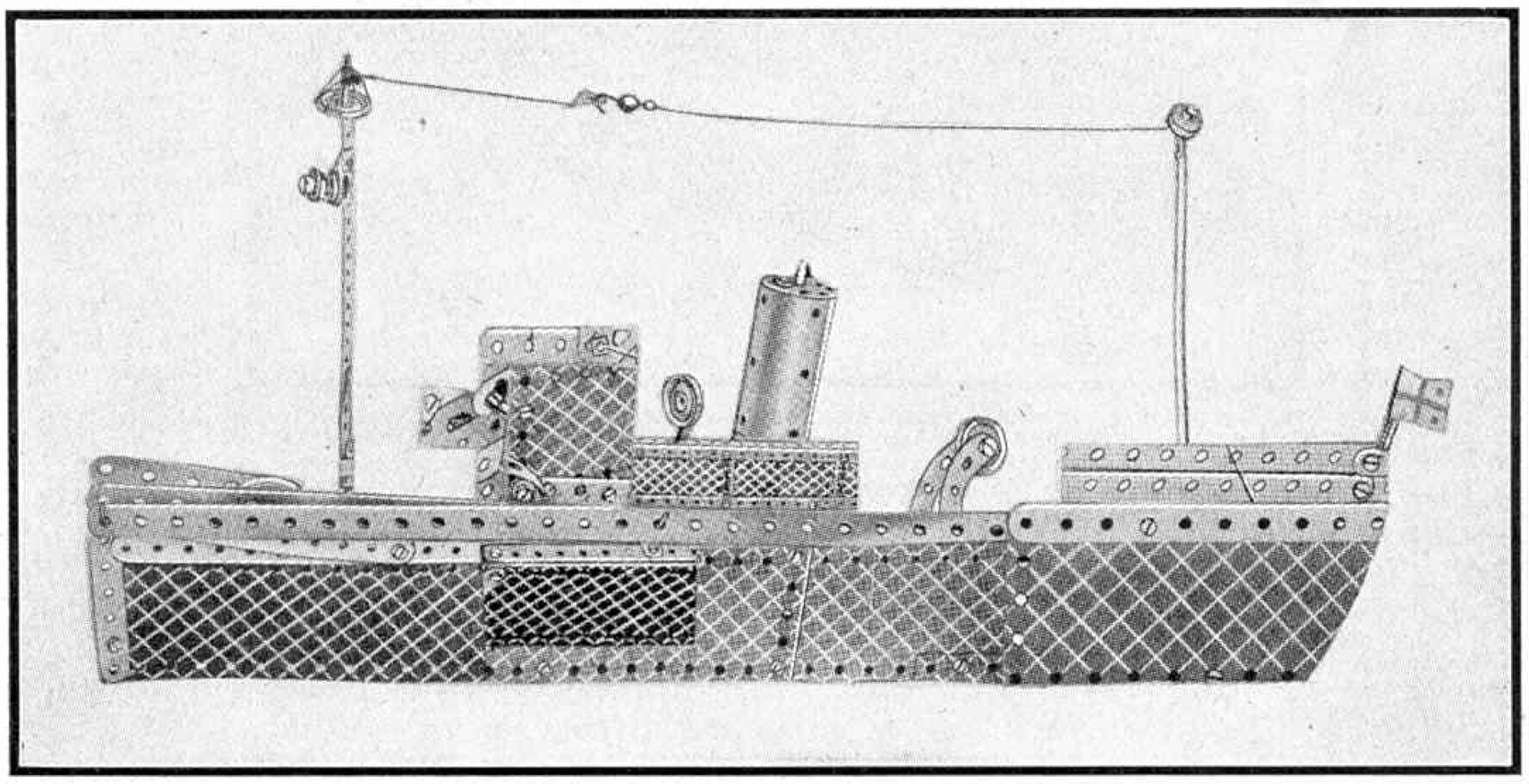
Parts required to build the model omnibus: 4 of No. 1; 18 of No. 2; 6 of No. 3; 2 of No. 4; 11 of No. 5; 3 of No. 6a; 8 of No. 8; 7 of No. 10; 1 of No. 11; 12 of No. 12; 2 of No. 12c; 1 of No. 13; 1 of No. 14; 1 of No. 15; 1 of No. 15a; 1 of No. 16; 2 of No. 20a; 1 of No. 20b; 1 of No. 22; 1 of No. 23; 1 of No. 23a; 1 of No. 24; 1 of No. 26; 1 of No. 32; 4 of No. 35; 150 of No. 37; 10 of No. 37a; 24 of No. 38; 1 of No. 45; 1 of No. 46; 2 of No. 48; 7 of No. 48a; 2 of No. 48b; 1 of No. 51; 1 of No. 52; 3 of No. 53; 2 of No. 54a; 4 of No. 59; 2 of No. 90; 4 of No. 90a; 2 of No. 111; 2 of No. 111a; 6 of No. 111c; 1 of No. 125; 2 of No. 126; 1 of No. 126a; 1 of No. 147b; 1 of No. 186; 4 of No. 187; 4 of No. 188; 5 of No. 189; 6 of No. 190; 2 of No. 191; 4 of No. 192; 2 of No. 193; 2 of No. 195; 2 of No. 197; 1 of No. 198; 1 of No. 199; 2 of No. 200; 1 of No. 214; 8 of No. 215; 2 of No. 217a; 2 of No. 217b. 2–2″ Motor Tyres and 1 E120 Electric Motor (not included in Outfit).

Do You Know Your Manuals?

Prizes for Keen-Eyed Readers

Every Meccano enthusiast who is familiar with the various models in the Instruction Manuals has a fine opportunity to win a big prize by entering this Contest. There is no model-building to do, and all that a competitor needs to prepare his entry are a copy of the Instruction Manual for Outfits Nos. 0-6, a pencil and a postcard, and last, but by no means least, a pair of keen eyes!

The illustration of a cargo liner that appears on this page is made up from 20 pieces cut from illustrations of models in the Instruction Manuals for Outfits from No. 0 to No. 6. Competitors in this Contest are asked to study the illustration carefully, and then to write down on a post-card the Manual numbers and names of the models from which are cut the 20 pieces that together make up the complete illustration.



This picture of a cargo liner is composed of 20 fragments cut from illustrations of models in the Meccano Instruction Manual for Outfits Nos. 0-6. Prizes are offered to readers who can identify the models from which the fragments have been taken.

At first sight the task of identifying each of the fragments may appear very difficult, but competitors who compare the parts of the picture with the Manual illustrations will soon "spot" the origin of some of them, and it will then be great fun to track down the models from which the rest have been taken. The Meccano parts included in the various scraps will help considerably in solving their identity. For example, if a fragment contains part of an Angle Girder or Cylinder, it is at once obvious that it has been taken from an illustration of one of the larger models. On the other hand, if the only parts shown are Strips and Pulleys, it is probable that the fragment has been cut from one of the simple models. Entrants are warned that the pieces are not necessarily printed in the same angular positions in the illustration on this page as they occupy in the Manual; some of them may even be upside down.

Competitors who cannot identify all the pieces should not be deterred from sending in their entries. They may easily obtain one of the many prizes offered, for if no competitor succeeds in identifying all the pieces in the illustration, the prizes will be awarded to the readers who send in the best attempts. If more than one competitor names every fragment correctly, the prizes will be given to those whose entries are the most neatly and clearly prepared, and the decision of the judges must be accepted as final.

The Contest is open to readers living in any part of the world, and there is no age limit. Each competitor is allowed one attempt only. The prizes to be awarded are as follows: First: Meccano or Hornby products value £3/3/–; Second: products value £2/2/–; Third: products value £1/1/–. Five prizes of products value 10/–. Five prizes of products value 5/–.

The closing date for receipt of entries is 31st August 1938. These must be by post-card only, and should be addressed *"Sharp Eyes Contest No. 1,"* Meccano Ltd., Binns Road, Liverpool 13. Prize-winners will be notified by letter as soon as possible after the closing date.

A Novel "Meccanitian" Contest

In this simple competition prizes are offered for original humorous figure models. Entries may be simple little models showing a figure in an absurd situation or engaged in some humorous task, or they may be groups of several figures, while animals also may be included. As examples of what is required we suggest a dentist "at work" on his patient, or a clown performing tricks, and other ideas will readily occur to model-builders. Entries must be original and they should be as humorous as possible; the more amusing the effect, the greater the chance of winning a prize.

When the model is built it is only necessary to make a drawing or better still obtain a photograph of it. The competitor's age, name and full address must be written on the back of the illustration and it should then be enclosed in an envelope addressed "Meccanitian Contest," Meccano Ltd., Binns Road, Liverpool 13.

The Contest is open to readers of all ages, and entries will be divided into two sections, as follows: (A) for readers living in the British Isles; (B) for readers living Overseas. Any model submitted must be the competitor's own unaided work, both in design and construction.

Prizes of Meccano or Hornby products to the value of £2/2/–, £1/1/– and 10/6 respectively will be awarded in each section to the senders of the three most cleverly constructed and amusing models, in order of merit. There also will be several prizes of products value 5/–. Prize-winners will be allowed to select whatever goods they wish to the value of their prize from current Meccano and Hornby catalogues.

The closing date for Section A is 30th July 1938. Section B will remain open until 31st August 1938.

Model-Building Competition Results

by "Spanner"

"New Year" Contest (Home Section)

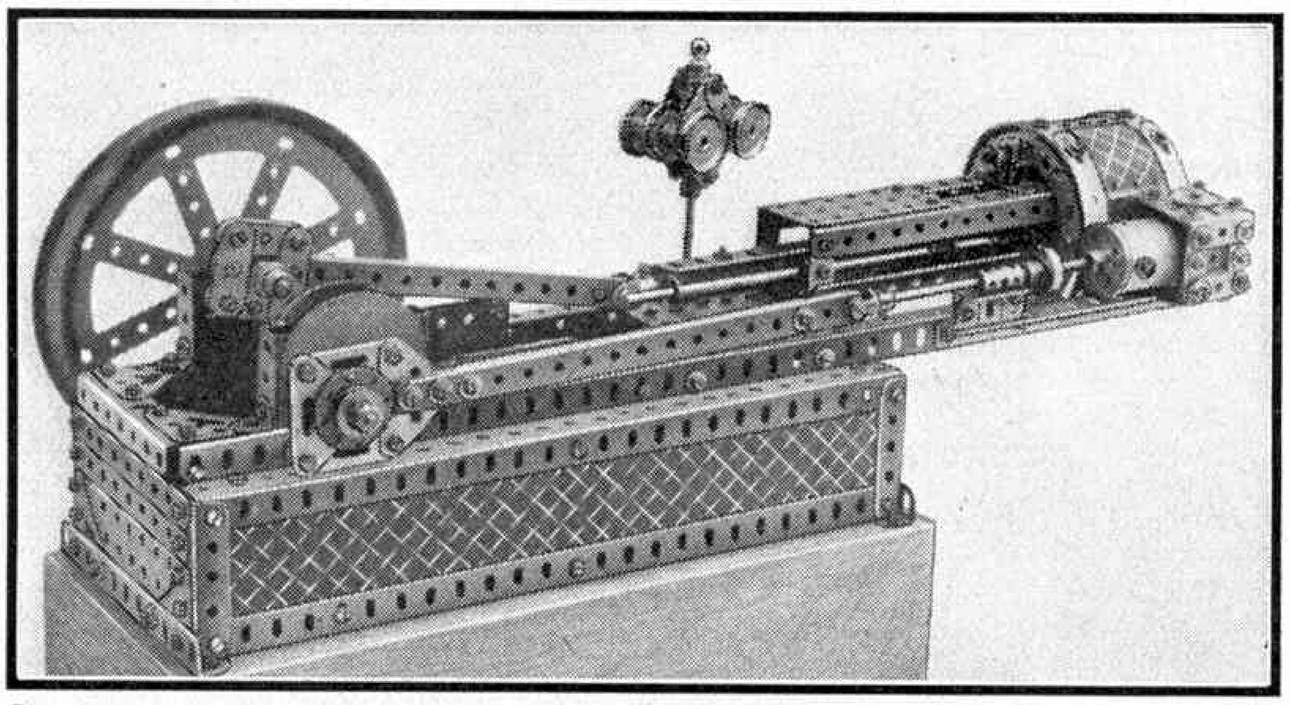
The complete list of prize-winners and the recipients of Certificates of Merit in the Home Section of the "New Year" Model-Building Competition are as follows:

1st Prize, Meccano or Hornby products value £3/3/–: S. Coates, Pudsey. 2nd, products value £2/2/–: P. Gibbs, Berkhamsted. 3rd, products value £1/1/–: R. Wighton, London, W.9.

Products value 10/6: J. Robinson, Dunton Bassett;. P Stutley, Sevenoaks; F. Thomson, London, S.E.1; N. Bloom, Birmingham; N. Jones, Rhyl.

Products value 5/–: H. Munson, Marlow; D. McIntyre, Plymouth; H. Lee, Ardrossan; W. Lowe, Stoneyhurst; A. Ericsson, Belvedere.

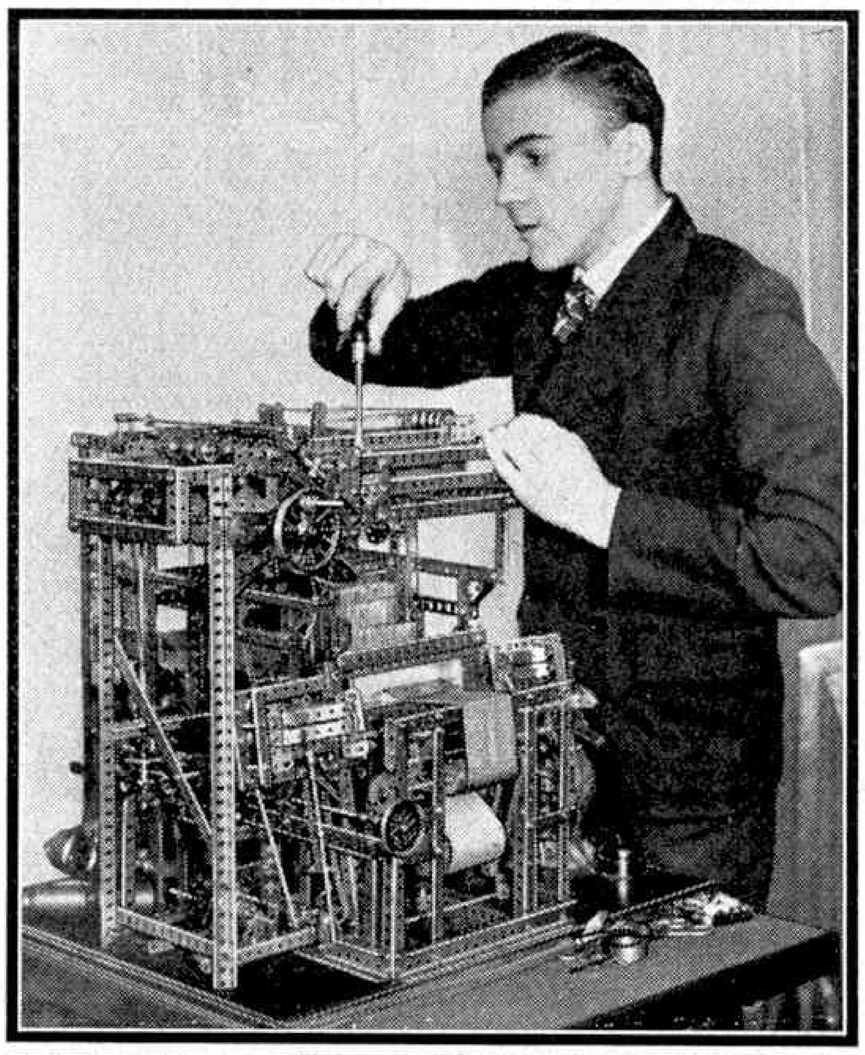
Certificates of Merit: R. Edge, Birmingham; A. Turner, Glasgow; A. Ventura, London, N.15; R. Jaggar, Huddersfield; M. Booty, Felixstowe; T. Johnson, Birmingham; R. Parker, Swansea; J. Irwin, Belfast; K. Frith, Sheffield; F. Mayhew, London, W.17; C. Watts, Harrow; J. Fitz, New Milton; F. Mee, Coleorton; B. Brown, Kettering; D. Leadbeater, Manchester; S. Hill, Berkhamsted; A. Watson, Sunderland; W. Gunn, Caterham; J. Boyce, Smethwick; D. Bayly, Bickley; I. Simmons, Birkenhead; J. Stedman, Marlow; G. Kimberlee, Mortimer; G. Mansfield, London, S.E.24; A. Nuth, Castleford; R. Baxter, Stockport; R. Burbridge, Brighton; G. Cooper, Castle Cary; I. Kirkby, London, S.E.20; E. Barker, Sheffield; W. Kirshner, Gravesend; R. Johnson, Leigh-on-Sea; H. Thomas, Edgware; G. Walker, Warwick; J. Walker, Warwick; J. Kent, Gloucester; W. Hudson, Chatham; P. Hampton-Smith, Bickley; V. Gowers, Hedington; C. Sparne, Hull; D. Hughes, Barking; J. Croudace, Whitley Bay; J. Brown, Hastings.



Strength and neat construction are outstanding features of this model horizontal steam engine. It was built by N. Bloom, Hockley, Birmingham, who was awarded a prize in the "New Year" Contest.

Many splendid working models of different types of loom have been built in Meccano and illustrated from time to time in the *"M.M."* and this month I am able to illustrate a further model of this kind. It was built by Stanley Coates, Pudsey, near Leeds, who won First Prize in the "New Year" Competition with it. As will be seen from the illustration the model is a very complicated piece of work, and a striking feature is the neat manner in which the mechanisms that operate the various motions are assembled. The model is designed to weave ties in many different patterns, and it includes a novel mechanism that causes a lamp to be illuminated as each tie length is completed. The loom is driven by an Electric Motor, and the picking sticks, which shoot the shuttle to and fro across the slay, operate at a speed of 90 picks per minute. I congratulate Coates on his excellent design and workmanship and hope that he will continue to send in entries for the *"M.M."* competitions.

Another model that pleased me very much is a novel shooting gallery. This is the work of P. C. Gibbs, Berkhamsted, for whom it won Second Prize. The gallery is approximately 2 ft. long, and at one end is mounted a gun, which is similar in design to that described on page 41 of the January 1936 *"M.M."* At the other end of the gallery there is a screen, on which is pasted a picture of three Hawker "Hart" bombers. Fixed to the most vulnerable part of each of the planes is a target consisting of a 1¼" Disc fastened to the top of a Strip that is pivoted on a Rod. Behind the screen there are three lights, each of which is placed at the same height as one of the targets. The lights are revolved by an Electric Motor, so that each target is illuminated in turn. When a target is knocked down by a shot from the gun, current for the lamp behind the target struck is automatically switched off, and another lamp mounted above the screen lights up to indicate that a hit has been made. Games of this kind offer plenty of scope for experiment, and I look forward to seeing other examples in future contests.



S. Coates, Pudsey, putting the finishing touches to the fine model loom with which he won First Prize in the "New Year" Contest.

Model omnibuses and trolley buses, either in chassis form or complete with bodywork, are always to be found in large numbers among the entries in suitable *"M.M."* competitions, and the New Year Contest was no exception. One of the models of this kind submitted in that contest was the best of its type that I have seen for some time. It was the work of Robert Wighton, London, W.9, and represents the chassis of a modern electric trolley bus. Wighton's effort is all the more remarkable in view of the fact that he is only 10½ years of age.

The chassis of this model is fitted with twin rear axles, each with its own differential, and the drive from the power unit, which is an Electric Motor, is transmitted through helical gearing. Ackermann steering gear with the goose neck reversed, as is customary in actual trolley bus practice, and electric lighting are other features of the model. Wighton's work shows great promise and I shall look forward to seeing further models from him in future contests.

A fine model of a giant universal excavator was entered by F. Thomson, London. This is a specially good effort, complete in almost every essential detail. It is mounted on creeper tracks. Unfortunately a gramophone motor is used as the power unit, and this fact had to be taken into consideration by the judges, accounting largely for the failure of the model to win one of the principal prizes.

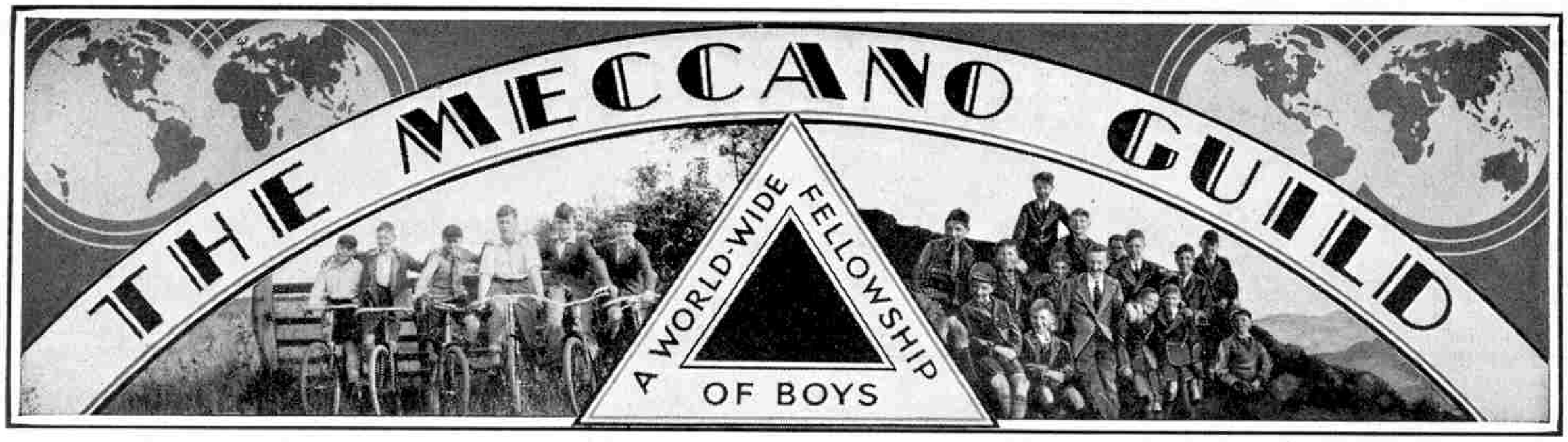
N. Bloom, Hockley, Birmingham, built the horizontal steam engine illustrated on this page. Outstanding features of the model are its sturdy and business-like construction, and the novel methods adopted in constructing the connecting rod "big end" bearing and the eccentric sheave. A glance at the illustration will reveal how these two parts are built up. A defect of the model is that the cylinder is too short for the throw of the crankshaft. As the inner end of the cylinder is not fitted with a cover the fault does not interfere with the working of the model, but it would be disastrous in an actual engine! In other respects, however, the model is well designed and constructed.

"Yuletide Incidents" Model-Building Contest

(Overseas Section)

Fine entries were received in the Overseas Section of the "Yuletide Incidents" Model-Building Competition, which was announced in the December 1937 issue of the *"M.M."* The principal prize-winners are as follows:

1st Prize, Meccano or Hornby products value £2/2/–: R. Carlill, Lakemba, N.S.W., Australia. 2nd, products value £1/1/–: J. Sultana, Valletta, Malta. 3rd, products value 10/6: L. Linder, Stockholm, Sweden.



A Devon Club Rally

I have often suggested to Leaders of neighbouring clubs that they should arrange joint meetings or excursions, for nothing is more delightful than for members of a Meccano club to meet those of another, and to form friendships with them. Nothing but good can come of meetings of this kind, as has been shown on many occasions. The joint meetings that are arranged by the Christchurch and Ashburton clubs in New Zealand are examples that come readily to mind. The two clubs keep in continual touch with each other, each exhibiting models at the other's Exhibitions, and the two joining in festival and celebrations as well as in rambles and excursions, and the result has been to widen greatly the interest of club life.

I am recalling this example because of an interesting meeting that recently took place in Exeter. In Devon there are strong clubs at Exeter, Plymouth and Sidmouth, each with a fine history of achievement behind it, and the splendid idea occurred to the three Leaders of bringing their officials and members together. Accordingly a rally was held at Exeter, the Meccano club there acting as host to the visitors from Plymouth and Sidmouth, who saw the members of the Exeter club at work in their club-room and were greatly interested in the display of Meccano model-building and Hornby Train operation. A joint meeting then followed, at which inspiring addresses were given by the officials of the clubs concerned. In addition the visitors were taken to see the Cathedral, the Guildhall and other places of interest in Exeter.

Meccano Friendships

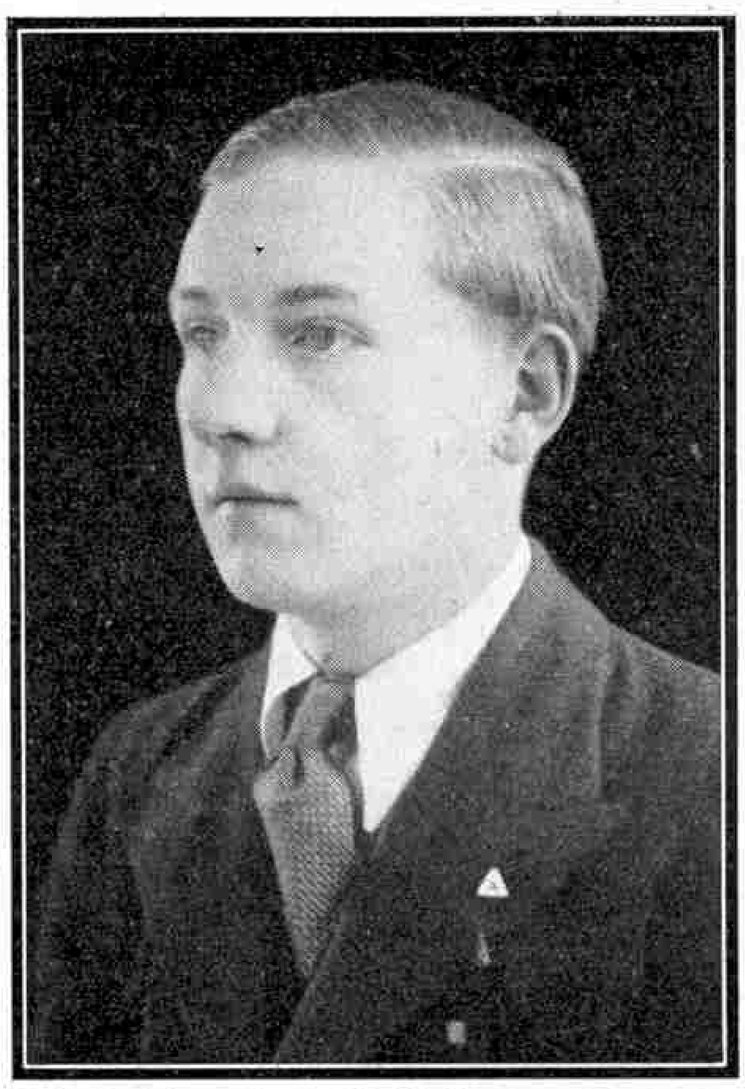
Altogether everybody had an enjoyable time and, from the club point of view, a very profitable one. Mr. Hodder, Leader of the Exeter M.C., afterwards wrote to tell me that "It was a grand day in every respect," and Mr. Ellis, Leader of the Plymouth M.C., commented on the homeliness of the proceedings and the rapidity with which members of different clubs who met as strangers became intimate friends.

The success of this splendid rally, which was well reported in the local press, was due in the first instance to the fact that members of all three clubs were thoroughly imbued with the Guild spirit. The careful preparations that were made by hosts and visitors alike contributed very largely to it, however. An interesting feature from the Plymouth point of view was the production of a neat and attractive programme by the printing section, which gives evidence of the efficiency with which the proceedings were organised.

The rally is the beginning of a series that are to bring together the three Devon clubs, all highly efficient in different ways, so that each will be able to profit from the methods and experience of the others. Preparations are being made for another reunion at Plymouth during the present month, and in this the St. Stephens M.C. from Saltash, just over the Cornish border, also will take part.

Meccano Club Secretaries

No. 44. M. L. Done



M. L. Done is secretary of the Wednesbury M.C., Leader, Mr. L. Morgan. This club was affiliated in March 1934, and has since made excellent progress. The programme includes Model-building and Hornby Railway operation, with Lantern Lectures and Film Shows, and several successful Exhibitions have been held.

Swimming and Life-Saving

Meccano club programmes for the summer now include a wide range of activities such as excursions, camping, visits to works and other places of interest, speed boat racing and model aeroplane flying, in addition to photography, cycling and cricket. There is one pursuit to which I think more attention could profitably be given, however. This is swimming. In the past one or two Meccano clubs have turned their attention to this healthy and valuable exercise, and in 1933 the Middlesbrough M.C. formed a team that held its own in swimming matches against local clubs, but generally speaking it has been somewhat neglected.

A Swimming Section is not difficult to organise and run. Every centre of any importance now provides splendid facilities at comparatively small cost, and meetings can be arranged at the local baths once or twice a week. Two things should be kept in mind. One is the training of younger members in swimming, and the other is the arrangement of a good programme of races and other events for those who are already swimmers. Games also can be played in the water, and a special feature should be made of life-saving. If the Leader of the Section, or some senior member is unable to give instruction in this, it is usually easy to find some well-known local swimmer who is willing to do so, provided that members are in real earnest in their desire to learn.

I hope that Leaders of all clubs will carefully consider adding swimming to their programmes during the present summer period, and I shall look forward to hearing from those who adopt this suggestion.

A June Exhibition

The Bearsted M.C. are holding their Annual Exhibition on Friday and Saturday, 24th and 25th June, at the Thurnham Methodist Chapel, Bearsted. On the first day the Exhibition will be open from 6.30 p.m. to 10 p.m., and on the final day from 3 p.m. to 9 p.m., and the prices of admission are 6d. for adults and 3d. for children. An excellent display has been arranged, including interesting models on loan from Headquarters, and all who are interested in Meccano model-building and generally in Meccano club work will enjoy the display.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested should communicate with the promoters, whose names and addresses are given below:

EGHAM—Mr. R. Thake, 55, Laurel Avenue, Englefield Green, Egham, Surrey.

EAST MORTON—K. Moorhouse, 5, Cliffestone Drive, East Morton, Nr. Bingley, Yorks.

EGYPT—Mr. M. F. Awad, 36, Haret El Garamony, El Assal, Shoubra, Cairo.

Coloured Mission (Cardiff) M.C.—The club's Exhibition attracted over 200 visitors. The models on show included a large jib crane, a mobile crane, and a lorry and trailer that was run up and down the room, to the great delight of visitors. Attention was attracted by a number of "simplicity" models that contrasted well with a model traction engine on loan from Headquarters. A gift of Meccano parts has been received from John Hall (Tools) Ltd., local dealers. Club roll: 19. *Secretary:* D. H. Binstead, 37, Penhill Road, Llandaff Fields, Cardiff.

Great Baddow M.C.—Meetings have been well attended, and at one a "Memory" Model-Building Contest was held. In this a model was examined for several minutes by members, who were then required to construct similar models from memory. A Lantern Lecture was given on "*The Story of the Underground*," slides for which were kindly loaned by the London Passenger Transport Board. Club funds benefited from a very successful Carnival Dance. Model-building classes have been held for younger members, and senior members are progressing in the construction of a large model. An attempt is being made to form a Model Aircraft Section. Club Roll: 23. *Secretary:* K. L. Avis, 5, Crescent Road, Great Baddow, Chelmsford.

Winchmore Hill Collegiate School M.C.—Many ingenious "simplicity" models have been built. Hornby Railway and Model Aircraft meetings have been successful, a particularly fine model of a Hawker "Hurricane" winning a prize for its builder at one of them. A Cinematograph Show has been held, and a Treasure Hunt organised at the end of last term provided an exciting climax to the session. The Swindon Works of the G.W.R. have been visited, an interesting journey home being made on the "*Cheltenham Flyer*." Club roll: 29. *Secretary:* F. J. Hearn, 143, Conway Road, Southgate, London, N.14.

Middlesbrough M.C.—A Visit has been paid to the local fire station, where members inspected with interest the engines and fire fighting apparatus. An enjoyable afternoon was spent at the public swimming pool. Two Whist Drives proved very successful. The club's Annual Exhibition attracted many visitors, and the working models on show included a slag plant, dance band, and an electric turbine. The last meeting of the Winter Session was devoted to the drawing up of a syllabus for the summer months. Club roll: 25. *Secretary:* G. A. Brockhurst, 49, Heythrop Drive, Acklam, Middlesbrough.

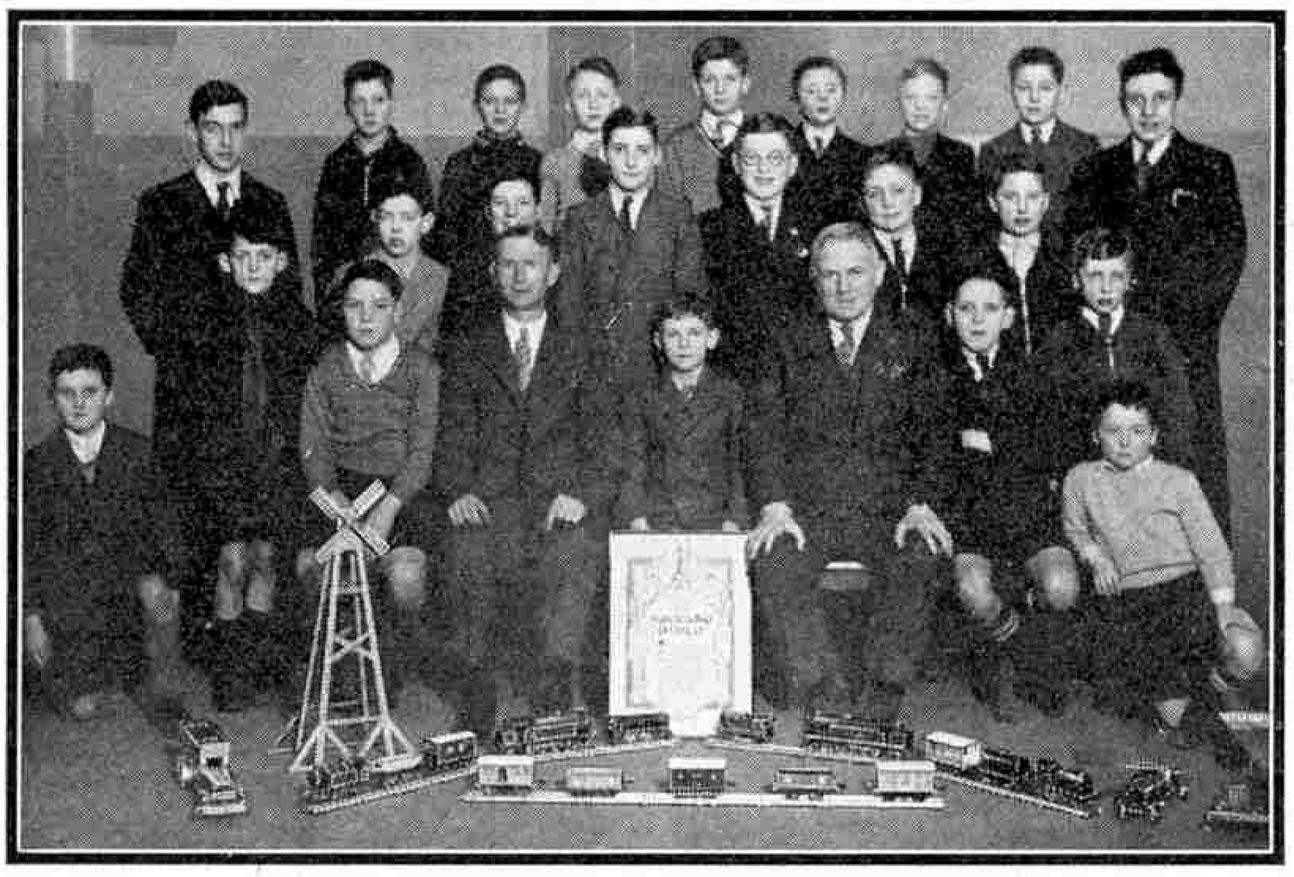
Bearsted M.C.—Many novel models have been constructed, and as a result of the high standard attained it has been decided to hold an Exhibition. There have been further Photography Meetings, and Excursions have been made to places providing good subjects for photographs. Visits have been arranged to Croydon Aerodrome and Southampton Docks. An epidiascope has been built, and is being tested. A Library has been formed. Club roll: 12. *Secretary:* Mr. R. A. McKeough, Ware Street, Bearsted, Nr. Maidstone.

Cold Harbour M.C.—Meetings have been devoted to the construction of models for display on the Hornby layout, which now looks much more realistic. Improvements also have been made in the design of track to allow more efficient train running. Club roll: 21. *Secretary:* R. S. Hill, Anstie Farm, Cold Harbour, Surrey.

Islandmagee M.C.—New members have been enrolled, and it is hoped to add still further to the membership. An enjoyable Social was held at the close of the Winter Session, and the President presented the Merit Medallions and prizes won during the session. Members have been formed into groups for model-building and track operations on the Hornby layout. Regular Games Evenings are held, and a field has been secured for outdoor sports. "*The Gazette*," the club magazine, is published regularly. Club roll: 7. *Secretary:* S. McCready "Hillmount," Islandmagee, Co. Antrim.

Colchester M.C.—Meetings have been devoted to the construction of models for the forthcoming Exhibition. Outstanding among these is a model tramcar fitted with an electric motor that collects current from an overhead wire, while other models include a planing machine, threshing machine and an excavator. Junior members contributed a number of interesting models, including one of a theatre, with orchestra and organ. Club roll: 28. *Secretary:* F. D. Cole, 8, Priory Street, Colchester, Essex.

Wednesbury M.C.—Good progress is being made in club activities, and there has been a noticeable improvement in the standard of model-building. The Railway Section has been re-formed, and the track, rolling stock and accessories are being overhauled. A layout with controls at two main points is being planned, and there will be extensive scenic effects. Model-building Contests are held regularly, points being awarded for the best models. A prize is given each month for the member who gains the highest number of points. Interesting films shown have dealt with "*Our Herring Industry*," "*Methods of Communication*" and "*Cattle Ranching*." A very enjoyable Social was held, the programme including a gramophone recital, dancing, and community singing. Occasional Games Evenings are held, and Table Tennis and Darts tournaments are keenly contested. A Spelling Bee has been arranged. Club roll: 25. *Secretary:* M. L. Done, 31, Waverley Road, Darlaston, Wednesbury, Staffs.



The Morison Memorial M.C., Leader, Mr. R. Smith; secretary, A. MacDougall. This club was affiliated in 1927, and is the oldest in Scotland, a distinction of which members are very proud. In addition to Meccano Model-building and Hornby Train operation, activities include woodwork, stamp collecting, electrical, and other practical hobbies. A special feature is made of regular Model-building Competitions.

Morison Memorial M.C.—Regular Model-building Competitions have produced a variety of interesting models. On Hornby Nights track operations are followed with keen interest. An Electrical Section has been started, and a group has been formed for making artificial flowers from wax. Club roll: 35. *Secretary:* A. McDougall, 71, Dumbarton Road, Clydebank.

Hornsea M.C.—Attendances at meetings of all sections of the club have been excellent. On Hornby Evenings there has been some very efficient train running, with heavy traffic at the main station. A number of Lectures have been given, the subjects including "*The Cinema*," "*Diving*" and "*The B.B.C.*" Social Evenings are held regularly, at which games are played. Club roll: 19. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

Breich M.C.—An increase in the stock of Meccano parts available for Model-building Evenings has allowed bigger and better models to be built. The club has been divided into Junior and Senior Sections. The Meccano Lecture on "*The Romance of a Great Toy*" was much enjoyed. Considerable excitement has been occasioned by the forthcoming award of Merit Medallions. Club roll: 11. *Secretary:* M. Anderson, 36, Breich Terrace, West Calder.

Mall School M.C.—Model-building Meetings have been devoted to the construction of models for the Annual Exhibition, other features of which were a Hornby layout operated by members, a display of Dinky Toys, and a collection of war relics and curios. One of the most curious of the latter was a Chinese grave-finder, by which one is supposed to be able to tell where one will be buried. No entrance fee was charged, but voluntary subscriptions amounted to over £5. General Knowledge tests have been held, and a Spelling Bee proved popular. Club roll: 35. *Secretary:* A. C. James, 45, Popes Grove, Twickenham, Middlesex.

Sid Vale M.C.—Tricycles were the subject of a recent Model-Building Contest, and many interesting models were constructed, including a realistic one of the well-known ice-cream tricycle. Miniatures of workshop machines and guns were constructed in other competitions, and considerable ingenuity was displayed in their construction. Club roll: 25. *Secretary:* L. R. Gliddon, Sheffield House, Sidmouth.

Stretford Public Libraries M.C.—Many interesting models have been brought to meetings, including one of the Eiffel Tower, the lift of which was worked by a miniature steam engine. An overhead travelling crane, with ingenious operating mechanism, and a combination safe were other noteworthy efforts. Photographs are taken regularly of models built. The Stamp Section has held several meetings, and Lectures, Stamp Knowledge Competitions and Stamp Games have been the chief items of the programme. Two general Lectures have been given on "*The York Railway Museum*" and "*The Production of a Modern Newspaper*," respectively. Club roll: 35. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

Sutton Valence Council School M.C.—Enthusiastic constructional work has produced a number of fine models. Subjects for "Surprise" Contests were a "Cum-bak," a wire-rope maker and a merry-go-round. The Hornby Group has attracted considerable attention with train operations, and tests have been held in point-switching and signalling. The layout has been arranged to correspond to the local Southern Railway line. Club roll: 21. *Secretary:* C. Austin, East Sutton Park Lodge, Sutton Valence, Kent.

St. Oswald's M.C.—Several new members have been enrolled. Model cranes have been constructed, and work has been put in on models for the Exhibition. Talks have been given on "*Camping*" and "*Printing and Binding*." At a Film Show members saw "*In the Steps of the Conquerors*" and the exciting "*Further Adventures of the Flag Lieutenant*." Games Evenings have been occupied with charades, table tennis and cards. Club roll: 30. *Secretary:* J. F. Jaques, 5, Ingram Road, Thornton Heath, Surrey.

NEW ZEALAND

Christchurch M.C.—When Mr. L. P. Chapman recently removed to Dunedin, thus severing his connection with the club, appreciation was expressed of his long and loyal service. Out of the friendly rivalry existing between the Christchurch and Ashburton Meccano Clubs has arisen an "Inter-Club" Model-Building Contest. A trophy is to be competed for twice each year. Four models are entered by each club and two of these must be built by members under 13 years of age. Points will be awarded for constructional skill and accuracy. Club roll: 37. *Secretary:* S. S. Stringer, 250, Oxford Terrace, Christchurch, New Zealand.

SOUTH AFRICA

Southern (Capetown) M.C.—A club model has been built of a fine bridge across the River Paarl. The Stamp Section and Library are making good progress. A Lecture has been given by Mr. R. H. Moodley, Leader and secretary, on "*Robert Stephenson*." A Meccanograph is being built. *Secretary:* R. H. Moodley, 10, Stirling Street, Capetown, Cape Province, South Africa.

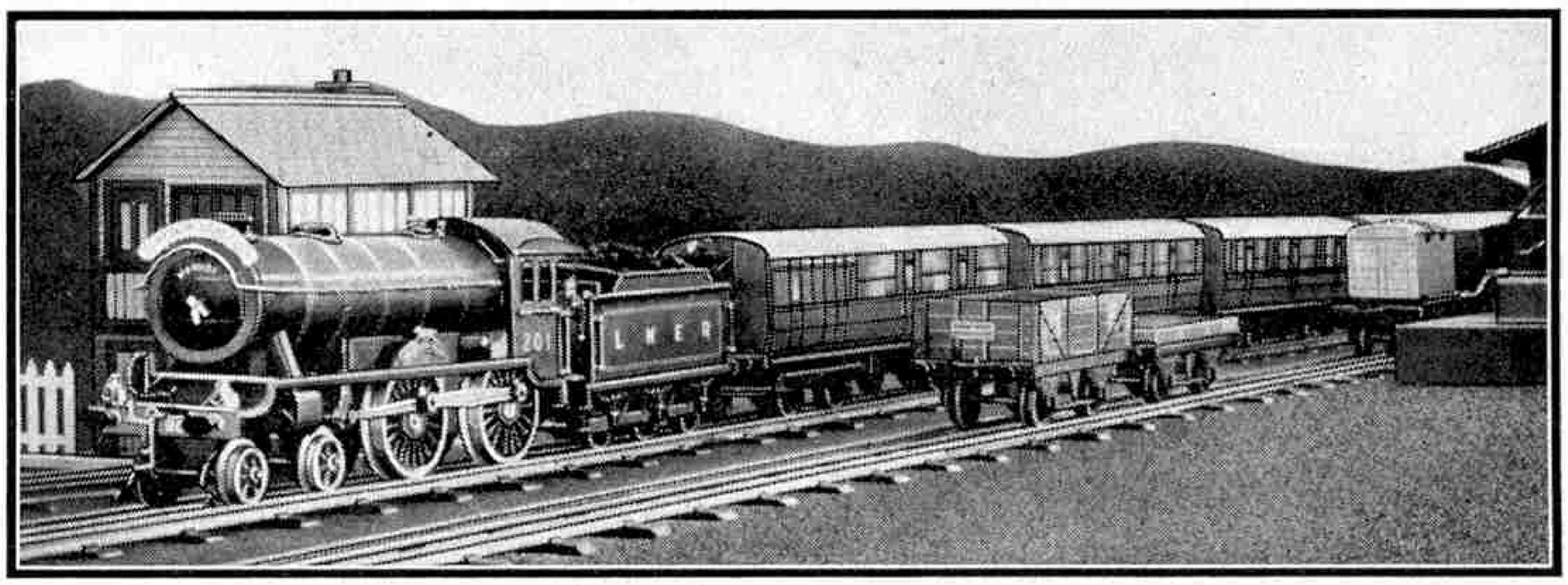
"Other British Railways"

The Fascination of Miniature Systems

By Edward Bingley

THE reason for the title of this article is that under the heading "Other British Railways" the former "*Railway Year Book*" used to give a list of railways not included in the four main line companies, concluding with a summary of "Remaining British Railways Owning Rolling Stock." It is not about these that I am writing, however. Their number was between 50 and 60, but the "other British railways" that I am referring to are legion and are increasing in numbers. They are the model railways that flourish in countless homes, built, maintained and managed by boys, young and old.

Not infrequently the owner-manager of a layout spends precious hours of leisure time, and not less precious pence towards its perfection; and what latent artistry is expended in this perpetual quest towards completeness in detail and efficiency in operation! Some of the boys, particularly if they are on the wrong side of 30 and these are, perhaps, in the majority in the game, are rather touchy about their hobby. I have often wondered why. It's a grand hobby, and to comfort any who may be suffering from the fear of an accusation of senility or second-childhood, let it be said at once that the wielder of this pen counts high amongst his model railway friends an artist, a bank manager, the managing director of a newspaper business, a retired engine driver, a railway officer, a baronet, an army officer, a solicitor, and, as the writer of the Scriptures says "likewise many."



A fascinating scene on one of Britain's countless "Other Railways." The L.N.E.R. "Scarborough Flier" reproduced on a Hornby layout, with a miniature No. 201 "The Bramham Moor" at its head.

The retired engine driver of this goodly company, who was famous in the service of the L.N.E.R., will ever be remembered for the way in which, in the very afternoon of his retirement, he visited a London emporium and, after spending many pounds on the nucleus of a model railway system, returned to King's Cross with his parcels. Proudly displaying them, he explained that they were, of course, for his grandson!

Wherein lies the fascination of this hobby? Most "*M.M.*" readers of course will know already. The fascination of movement that is brought possibly to its highest pitch in the locomotive with all its moving parts is, perhaps, at the root of it. Whatever it is, it results in hundreds of model railway systems in homes and in gardens throughout the land.

The owner of one such railway system will always impress on a visitor the great quality needed for satisfactory model railway work, unless one has unlimited means. This requirement he is pleased to call the "Nelson touch;" in other words, "the blind eye," or, if you will, the gift of imagination. This particular railway began one Christmas over 25 years ago, with a few lines on the dining-room table. It is not much bigger now, thanks to the limitations of size of modern dwellings, but a wealth of thought and even affection has been bestowed upon this line. How often has it been transformed, reorganised, extended, in the quest of perfecting the imperfect!

The system now occupies two baseboards, each 6 ft. by 3 ft., which can be joined together. Not only can it be hidden away when not in use, but it can be taken bodily into the garden during the summer, and by the insertion of "leaves" it can be considerably extended. From a one-way track it has developed into a two-way track, with marshalling sidings, a passenger station and a locomotive depot.

The rolling stock, too, has changed in 25 years. Thanks largely to the enterprise of the firm associated with that good old friend of most boys, "*Meccano*," in placing on the market at reasonable prices, correct models of railway rolling stock, bogie coaches are now running where four-wheeled carriages used to bump their way along, and perfectly-finished locomotives haul the trains where crudely-finished caricatures used to thrill the boyish fancy. Still the triumphs of 25 years ago are not to be despised. There has been development, and here the realism of even the most unrealistic model railway shows itself, for the line of to-day is the development from that of yesterday, as in actual practice.

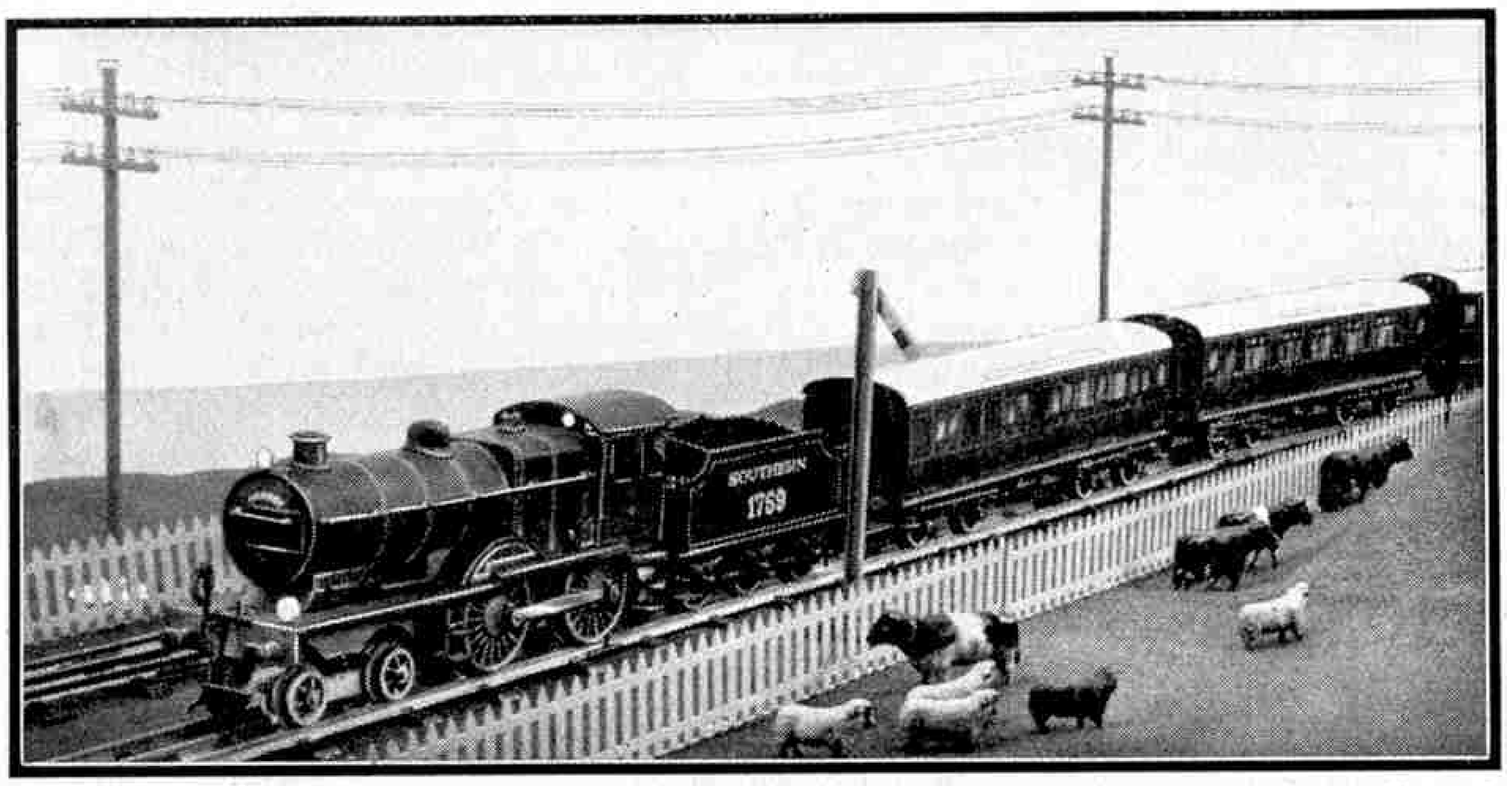
A better acquaintance with the realities of railway working has led to improved methods. The latest refinement is a system of co-relating locomotive capacity and load, a unitary system having been worked out on the basis of the weight of the lightest unit of rolling stock, and adapted to the tractive effort of the engines by tests.

So, bearing in mind the necessity for the free play of the imagination, or if you prefer it, the "Nelson touch," a model railway is not a childish toy. What fun it is to think, from time to time, of all the crack expresses there are in service, which even "*Mr. Bradshaw*" does not know about!

A "Southern Railway" Layout

Working Traffic on the "Kent Coast Line"

MINIATURE layouts based on actual railway practice are always of the greatest interest to readers, and a fascinating example reproducing part of the Midland Section of the L.M.S. was described on pages 294 and 295 of last month's *"M.M."* This is operated by members of the Bedford School Branch, No. 310 of the Hornby Railway Company, but such layouts are not restricted to Branch operations, and many individual H.R.C. members have layouts based on certain sections of their favourite real railways. The Hornby layout shown by the diagram on this page is a good instance. It has been built up by G. R. Breed, New Eltham, who is a keen *"M.M."* reader, and Hornby railway enthusiast, and represents the part of the Eastern Section of the S.R. between Charing Cross and Ramsgate via Chatham.



An express train on a Hornby S.R. layout headed by a Hornby S.R. Locomotive No. 1759 of the "L1" class. The train is composed of No. 2 Corridor Coaches and well represents a typical S.R. Eastern Section express.

The main line of Breed's layout is continuous and is arranged to provide double track working almost throughout. There are two terminal stations, representing respectively Charing Cross and Ramsgate, "Charing Cross" being the upper one in the diagram. A useful feature is the inclusion of triangular junctions in the connections between the terminal branches and the main line, making it possible to vary the routes of trains leaving the terminal stations in an interesting manner that also is realistic, for the S.R. has a veritable maze of alternative routes to many of the centres that it serves. In addition these triangular formations are useful for turning trains, complete with their locomotives, on arrival at the platform and after their passengers have been disposed of.

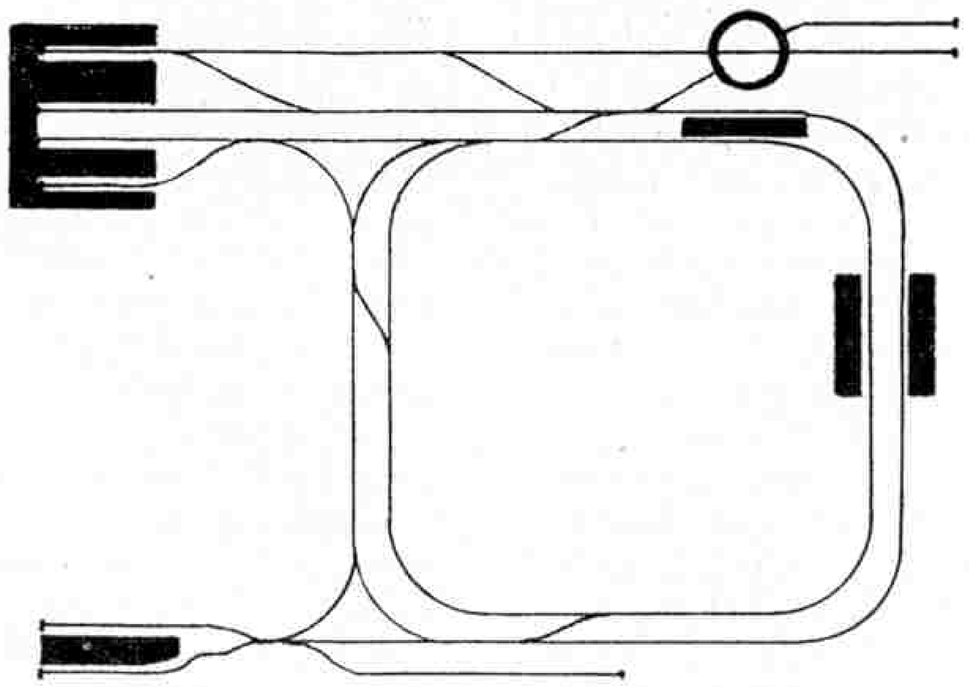


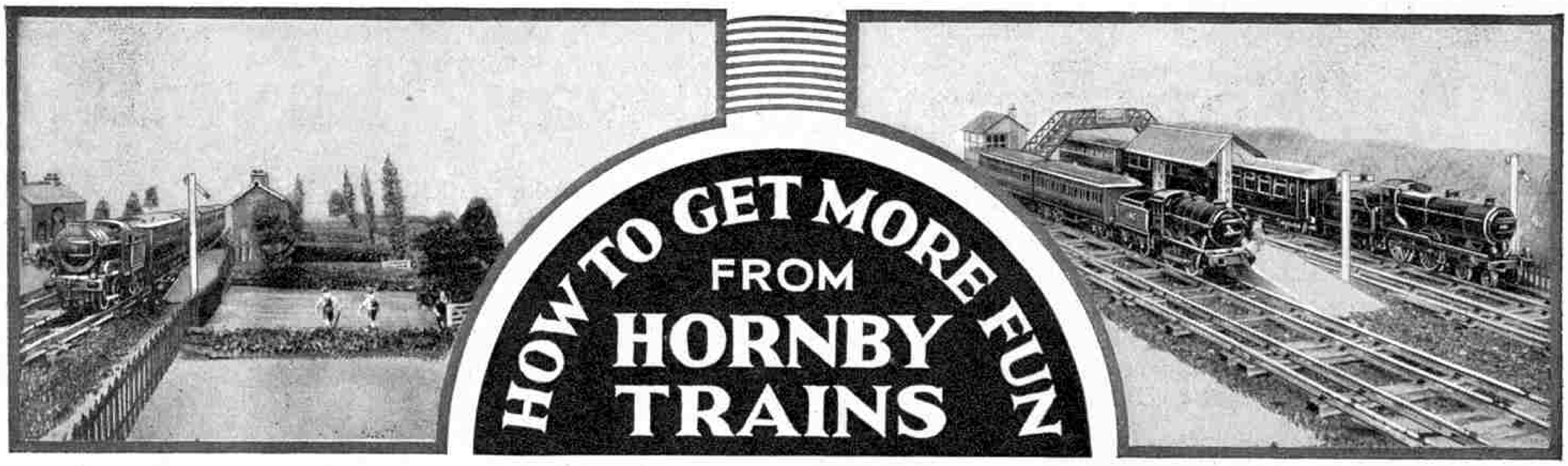
Diagram of the layout of G. R. Breed, which is described on this page.

One of the platform roads from "Charing Cross" is prolonged to run parallel with the main line, to which it is joined by means of crossover connections. The loop thus formed is useful for running engines round their trains when this is necessary. The same track leads to a turntable and engine sidings, which form the locomotive premises for the whole system. This concentration is necessary on most layouts owing to lack of space, but it has the advantage of keeping all the engines together, although a certain amount of "light engine mileage" is necessary.

The continuous main line is an advantage, for trains travelling between "Charing Cross" and "Ramsgate" can be run round it as many times as the operator desires before branching off to the terminal station. When this procedure is adopted, the intermediate stations can be used to represent different places en route each time they are passed. This is a commonly accepted form of model railway licence, which helps to give the impression that trains are travelling long distances.

Actual operations on this layout can be carried out in an interesting manner to represent various Eastern Section services of real practice. The E420 or No. 4C versions of the "Schools" class Locomotive *"Eton"* are particularly suitable, for the real "Schools" regularly run in and out of Charing Cross on Kent Coast trains. The "L1" class 4–4–0, represented in the Hornby Series by the E220 or No. 2 Special S.R. Locomotive No. 1759, also is a favourite with S.R. enthusiasts. The 4–4–0 type has long performed a great deal of hard work on the Eastern Section and the Hornby "L1" is thus most suitable for "Kent Coast" work. A recent development has been the employment of larger engines, so that it will be quite in order to use the largest Hornby S.R. express engine, the No. E320 or No. 3C type representing the real *"Lord Nelson."*

A feature of S.R. practice that can be effectively reproduced is the use of white discs in daylight on the engines instead of lamps. They are arranged as "engine head signals," to use the official term, to show the route that the train is to take. Miniature discs are provided with the Hornby "Eton" Locomotive, but those who require them for other engines can easily make suitable discs from thin white card, such as a postcard.



HORNBY LAYOUTS IN THE GARDEN

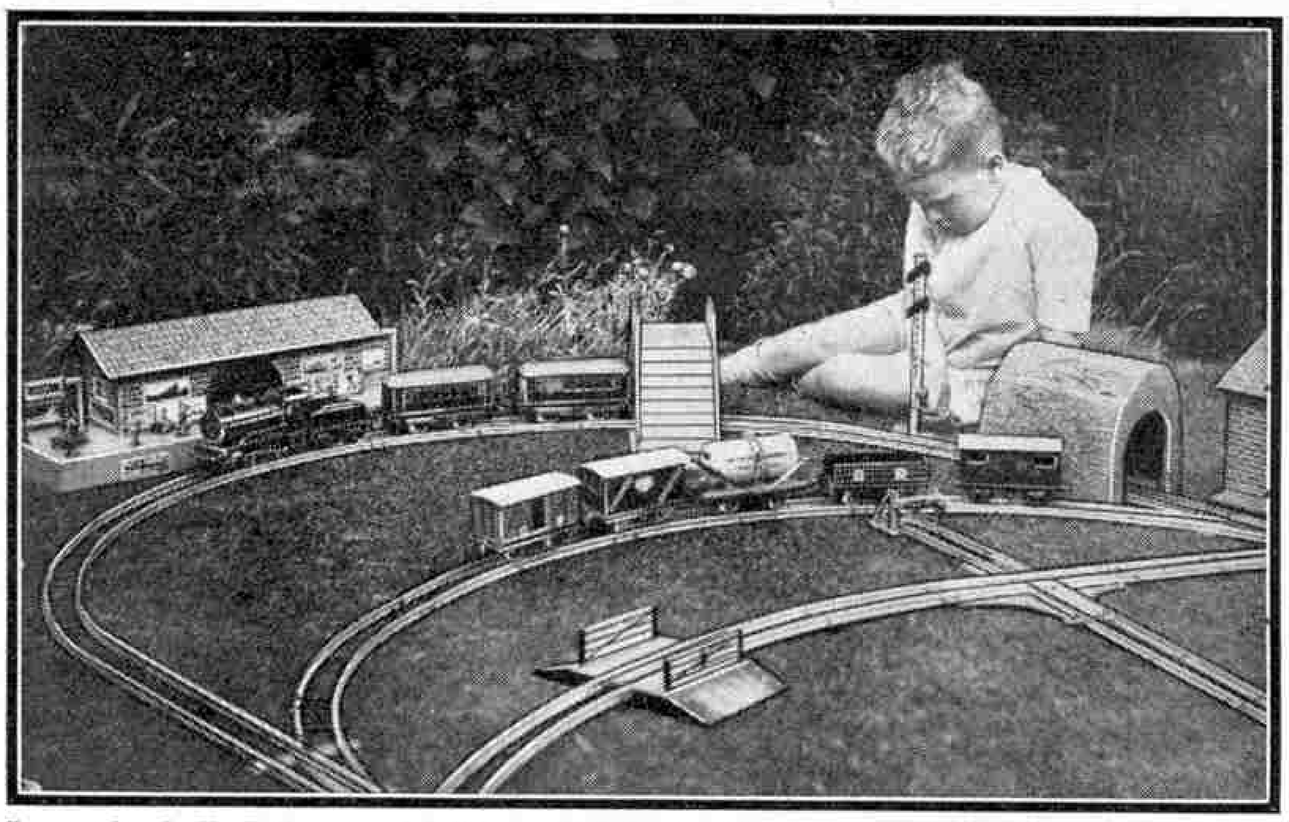
WITH the commencement of Summer the idea occurs to many Hornby Railway owners to arrange their layouts in the garden, or elsewhere out of doors. A permanent outdoor system cannot be arranged with Hornby material, for Hornby track and stock are designed essentially for indoor use, but on a fine dry day it is possible to have plenty of fun with it in the garden. Very attractive schemes can be followed with outdoor layouts, and striking results impossible indoors can be achieved, since more space usually is available, and excellent scenic surroundings of an unusually realistic character can be built up. In this article suggestions are made for interesting developments of this kind.

As long as a few simple precautions are taken a day's outdoor running can be quite a success. In the first place the track and accessories must never be left out overnight, for they would rust rapidly, which would result in poor running, and points would probably become unworkable. For this reason it is best to take up the railway as soon as it is finished with, and the components should be given a careful rubbing with a slightly oily rag before being put away. This applies particularly to the track, but it will do no harm if the accessories and rolling stock also are wiped over in this manner.

Another possible source of trouble is the dust or grit that may find its way into the mechanisms of the locomotives, or the bearings of the rolling stock. Where the soil is sandy or very dry it is almost impossible to avoid this, but the use of a suitable paint-brush moistened with petrol or paraffin will help to clean out the grit after a spell of running.

These points are emphasised because of their importance. The next thing is to see where and how to lay the railway out of doors. If the garden contains a fair-sized stretch of lawn, this will immediately suggest itself as a suitable site for the establishment of the railway, provided that it is not damp. A level lawn is quite a good place provided that the grass is cut extremely short. It is useless to lay a track on long grass, for the rails cannot be settled down properly on it, and the running of the trains is hindered by the blades, which may even find their way into the working parts of the engines.

Excellent layouts giving good running can be arranged on a lawn if the grass is as short as that of a bowling green. As a rule these can be planned on a much larger scale than is possible in the confined space of the average room. The various buildings and accessories connected with the line look so much more realistic than on an indoor layout owing to the natural surroundings in which they are placed, and if any of the Dinky Toy Farmyard Animals are used they will seem to be very much at home!



Our reader J. H. Pothecary of Salisbury (H.R.C. No. 32477), enjoying fine fun with his Hornby layout in the garden! The rails are laid on grass that has been cut very close.

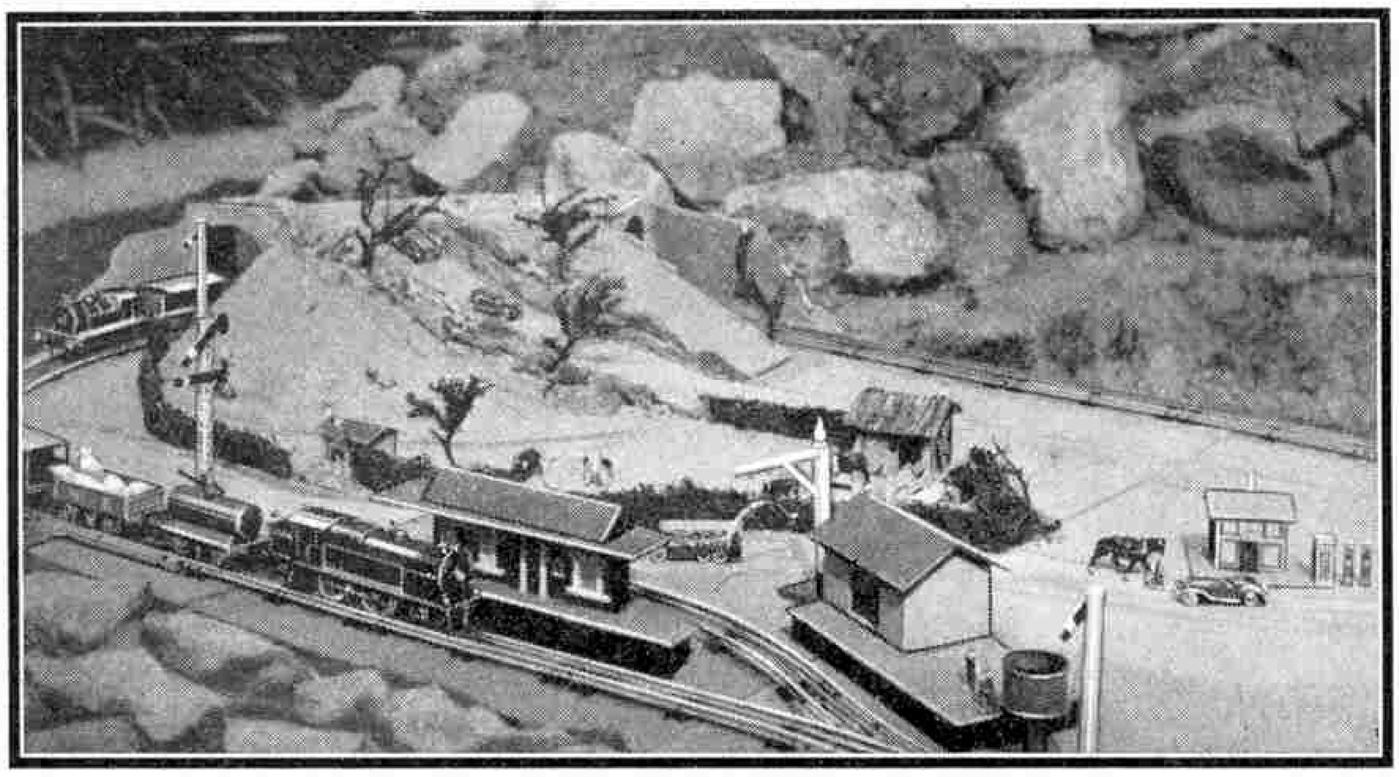
Where a lawn is not available for railway purposes, the track can be laid down on a level path or tiled walk. The long straight run that this usually gives is particularly effective, and the engines have a good chance of showing their power and speed when unhampered by curves. The inclusion of a continuous loop-line is sometimes possible, and the provision of a loop at each end allows non-stop runs to be made. The line can often be made to disappear at certain places behind shrubs or bushes, and this adds greatly to the interest as well as the realism of operations.

Whether the lawn or a path is to be utilised, laying out the track and accessories and taking them up again requires a great deal of time, especially if the work is to be done single-handed. If the layout is a large one, the time spent in laying and dismantling actually may be longer than that spent in operating the trains. Many readers overcome this disadvantage by fastening their rails to wooden baseboards arranged in sections. The different pieces of wood can be laid down in the position they are to occupy and the rails can then be secured in place. Care must be taken subsequently in assembling and fastening the different sections to avoid damaging the rail ends at these points.

In order to prevent the sections pulling apart when in use Rail Connecting Plates should never be omitted when arranging the layout. The advantage of this method is

that instead of a large number of individual rails and points having to be handled separately, there are only a few sections to be dealt with as complete units, and for this reason it might well be employed for indoor use as well as on layouts arranged out of doors.

The splendid effects that can be obtained on an outdoor railway are well shown in the illustrations to this article, two of which show layouts arranged on the lawn. The upper illustration on this page shows a railway laid on a baseboard consisting of a number of separate "leaves" or sections. This is operated by our reader N. Warrington, of Leicester. The layout is of the popular oval type, with a loop line at the main station, and the surroundings are remarkably natural and effective, for the railway runs through a rockery that gives a good representation of mountainous country. Some home-made scenery is used in addition. This includes a low "hill" under which the line is carried in a tunnel. The "hill" forms an approach to the more distant "mountains" of the real rockery. It is made up of wood, cardboard and brown paper and completed with small stones, miniature trees and shrubs, forming an effective set-piece that can be used equally well indoors when required. Round its lower slopes miniature hedging and other picturesque features are arranged, as can be seen in the illustration. In addition miniature figures, motor vehicles and accessories, some of which are Meccano Dinky Toys, add life to the scene.



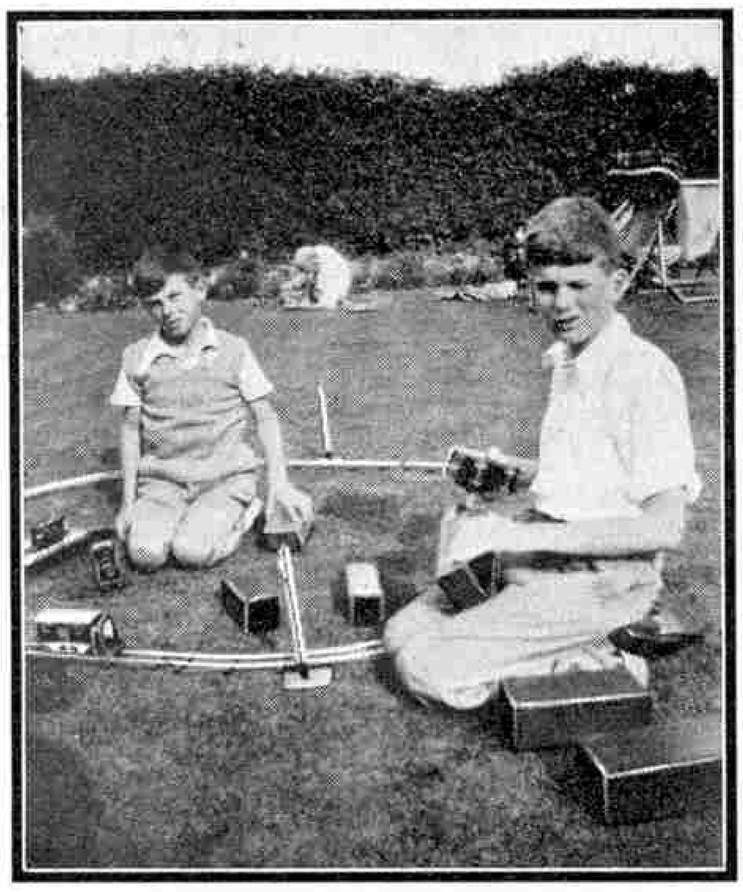
The Hornby Railway of N. Warrington of Leicester, arranged out of doors on a special sectional baseboard. The lineside effects are realistic and blend well with the natural surroundings.

Sometimes it is necessary to carry out a certain amount of excavation or filling where the railway is carried over rough or uncultivated ground. Over such sections the rails should always be laid on a baseboard, for if they were put down on the soil they would be liable to move even if well ballasted, and in any case it would be difficult to ensure that they were truly level.

It may be possible to include certain engineering features according to the nature of the ground. For instance the line may be carried over narrow "valleys" on the Hornby Viaduct. Bridges of special construction can be built of Meccano Parts and the completed structures look remarkably attractive in natural outdoor surroundings. If the bridge is built complete with its floor, as opposed to one that consists of girders built up on the actual baseboard, it is important to support it properly at each end. Its ends can rest on the ends of the baseboard adjacent to the gap spanned by the bridge. Alternatively they can be supported on bricks, if these are available, or on tiles laid flat; even inverted flower pots, one at each corner of the bridge look quite effective especially if they are partly hidden in the earth embankment.

It is good fun to carry out such operations on the lines of actual practice. As the work proceeds and a flat bed is prepared, the track is laid down section by section, so that the railhead is close to the operations all the time. "Spoil" from excavations is conveyed in Tipping Wagons and ordinary open Wagons from the point where the cuttings and valleys are being made to some other place where it is desired to raise an embankment. A really exciting morning or afternoon may be spent in "contracting" operations of this kind, especially if two or three boys work the scheme together.

On a railway out of doors there are always unlimited possibilities in the way of load-carrying. For instance, it may be imagined that the line serves a quarry. Gravel or sand is often found in gardens, and such material can be loaded into mineral trains, conveyed to some other point and there unloaded. Perhaps the material thus carried may be used in the construction of a short branch line, or for making a road in the neighbourhood of the railway. Mention of roads immediately suggests the use of one of the Hornby Level Crossings, which can be placed at some suitable point on the layout to lead a miniature highway over the line.

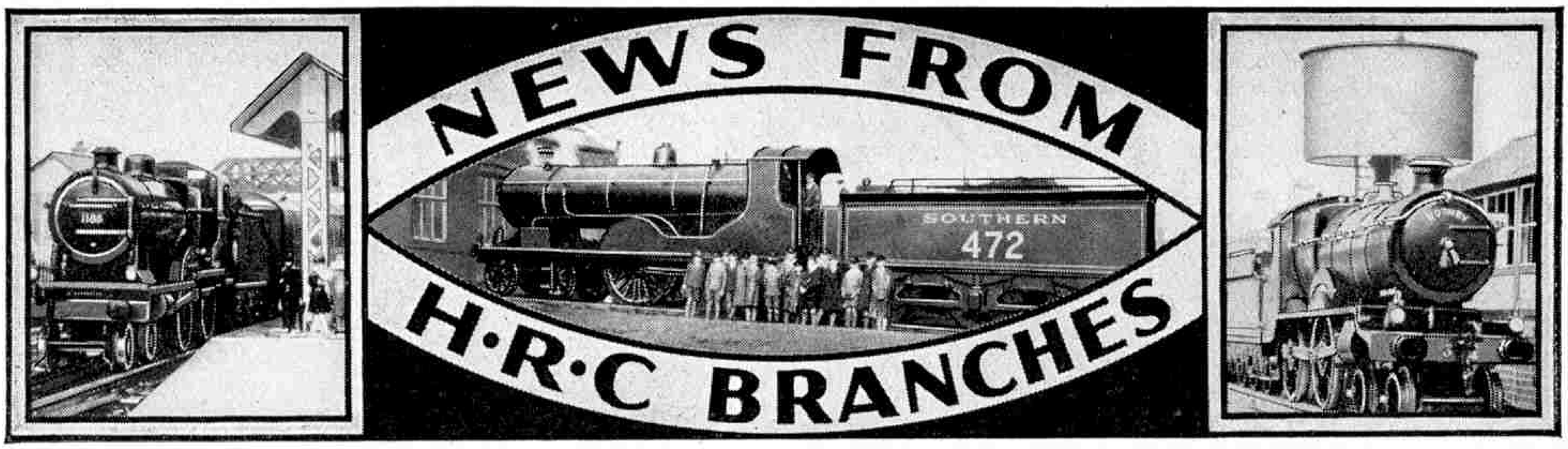


Commencing railway operations in the open. G. Goble, of Hayling Island, Hants., and his brother busy setting out their Hornby Railway.

Another kind of traffic that can be represented without difficulty is the carriage of lumber. Twigs of suitable size are usually to hand in the garden, and they look very well when trimmed and carried on Timber or Lumber Wagons, giving a splendid representation of the tree butts that are regularly transported by rail in certain districts.

In such circumstances a feature of real railways that can be readily reproduced is the provision of gradients. As all readers know, our chief main lines have only a small proportion of track on the level. For the most part the line undulates; as a rule the slopes are not great, so that the engines are capable of taking them "on the run" with a load. Sometimes, however, owing to an exceptionally steep gradient an assistant engine is necessary over a portion of the journey. Such is the case, for instance, on the Beattock incline in Scotland on the L.M.S. and the Lickey incline near Bromsgrove.

Gradients on model railways add greatly to the interest of the layout, but they should not be made too steep, for then the engines find them difficult to climb, and descending trains may attain dangerous speeds and perhaps meet with some mishap. Slopes of about 1 in 30 for electric locomotives, and 1 in 40 for clockwork locomotives, are the steepest that is advisable to use.



Branch News

GREAT BADDOW.—Excellent progress is being made at track meetings. A simplified form of signalling has been developed, and traffic control has been successfully introduced. Further experiments are being made in order to enable members to decide upon the most suitable method of control, and electric signalling is being tried out. Train marshalling and shunting demonstrations have been given. Secretary: K. J. Avis, 5, Crescent Road, Great Baddow, Chelmsford.

PURLEY COUNTY SCHOOL.—The meetings of the Spring term were well attended, and clockwork and electric train operations were carried out regularly. One evening was occupied by a Lecture on *"Engineering,"* with epidiascope illustrations. A Model Boat Section is being formed to meet at weekends, and another new section is engaged in the construction of model aircraft. Secretary: L. J. Vaizey, 26, Arundel Avenue, Sanderstead.

ISLEWORTH — Additional rails have been obtained, and a permanent layout is to be constructed. A fully-interlocked and signalled three-road siding is being laid down, with colour-light signals similar to those on the London Underground system. The end of term brought the final meetings of a very successful Winter Session. Chairman: Mr. K. Addinell, 4, Kenwin Court, 40, The Grove, Isleworth.

HURST HOUSE.—The Exhibition proved a great success and attracted a large number of visitors. The extensive layout on view was laid out on boards supported by trestles, and track demonstrations were followed by the working of an intricate timetable. A Meccano girder bridge was used as part of a flying junction. This had an incline of 1 in 24, but the club's Hornby *"Lord Nelson"* climbed it with ease when hauling three corridor coaches and a Pullman. Secretary: J. C. Moss, Hurst House, Hurst Road, Croydon.

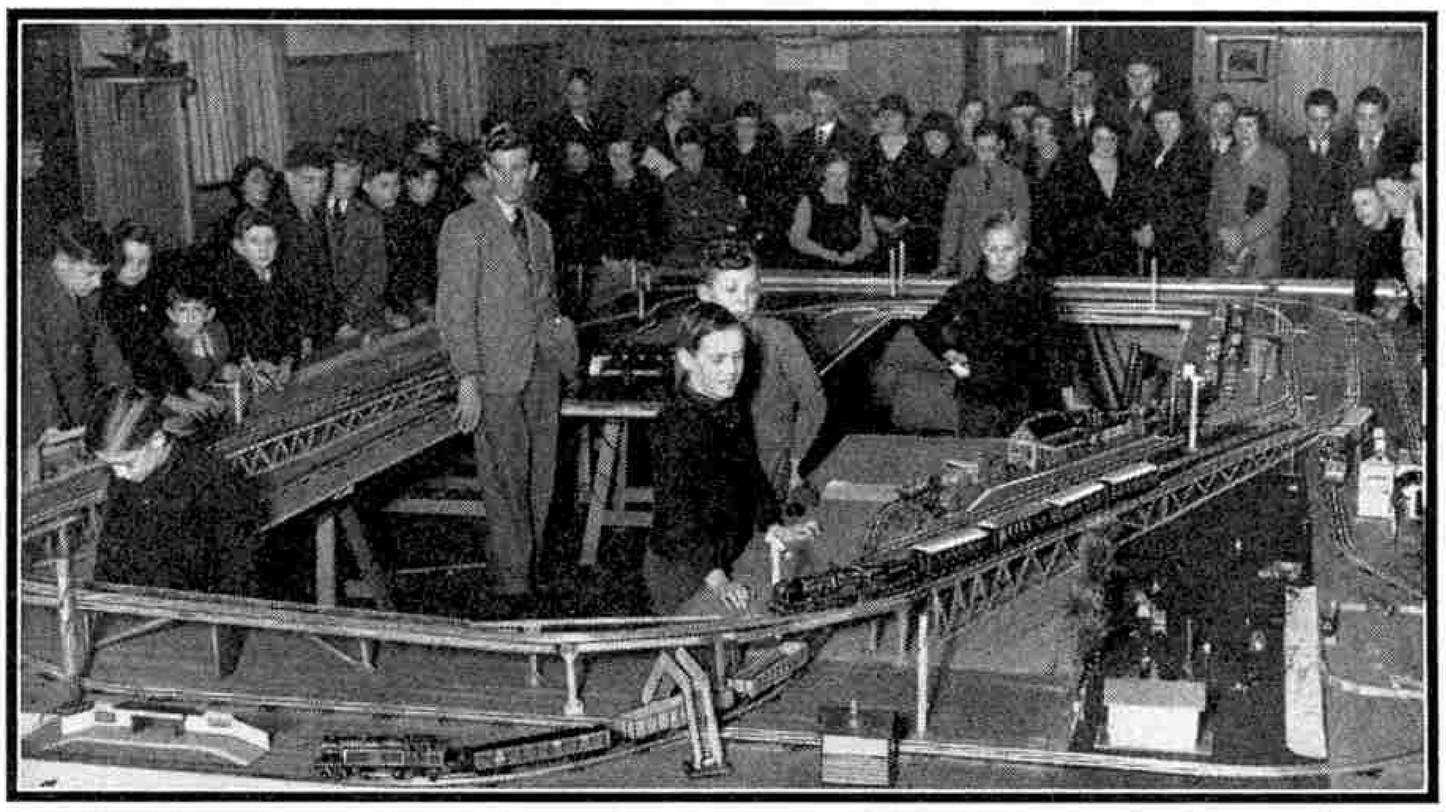
EDINBURGH HOBBIES CLUB.—Excellent progress is being made by this newly-incorporated Branch, which has Dr. William Whitelaw, Chairman of the L.N.E.R., as President, and includes well-known British model railway enthusiasts among its supporters. At the opening meeting the film *"Model Railway Craft"* was shown, together with sound effects. A large Hornby track is being laid down, and several members are constructing special rolling stock. Excursions have been arranged for the summer. Secretary: J. S. Dick, 62, Eyre Place, Edinburgh 3.

FISHPONDS (BRISTOL).—Extensive timetable running has been carried out on the Branch track, one evening's working including over 200 train movements. A successful experiment involved the hauling of 38 wagons by two Hornby No. 2 Special locomotives. The running of many famous British expresses has been reproduced, care being taken to incorporate appropriate rolling stock. A short Talk has been given on *"Model Locomotive Maintenance,"* and a Lecture on *"Locomotive Running"* is being prepared. Secretary: A. N. Ewing, 154, Thingwall Park, Fishponds, Bristol.

WATERLOO (DUBLIN).—Regular services have been maintained on the model railway, and improvements have been made on the layout. Renewals have included a locomotive, and three additional coaches have been added to the rolling stock. One locomotive is under repair, and a railcar has been overhauled and repainted. Secretary: S. B. Carse, 38, Oakley Road, Dublin.

TWYFORD GROVE.—The Branch rolling stock has been thoroughly overhauled and tested, and experimental timetables involving both passenger and goods trains have been worked. Members are busy constructing coaches and signals with material provided by the Chairman. A trip to the Swindon works of the G.W.R. was greatly enjoyed. A Cinematograph Show has been arranged. Secretary: J. Prescot, 6, Twyford Grove, Banbury.

ST. OSWALD'S.—Successful track operations on an electric layout have been carried out. A member gave a Lantern Lecture on *"Pictures of London."* Secretary: R. H. Shaw, 16, Covington Gardens, London S.W.16.



A general view of the large layout operated at the recent Exhibition of the Hurst House Branch, No. 337, Chairman, R. Ingram; secretary, J. C. Moss. This Branch was incorporated in December 1937, and extensive track operations are carried out on the Branch layout. This is operated electrically, and all members are given regular practice in the control and management of the trains run on it. Photograph by courtesy of the "Croydon Advertiser."

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this organisation should communicate with the promoters, whose names and addresses are given below:

BORSTAL—M. Gumbley, 14, Sir Evelyn Road, Borstal, Kent.

FAREHAM—G. A. Tull, Bridge Street, Wickham, Fareham, Hants.

HARROW—B. Baxter, 215, Harrow View, Harrow, Middlesex.

LIVERPOOL—J. Crookall, The Manse, Huyton, Nr. Liverpool.

LONDON—Mr. A. Sippett, 5, Moreton House, Garrett Lane, Tooting, London S.W.17.

LONDON—R. C. A. James, 311, Southend Lane, Lower Sydenham, London S.E.26.

NEW ZEALAND—G. Heron, 86, Endeavour Street, Lyall Bay, Wellington, E.3, New Zealand.

NOTTINGHAM—G. Whalley, William Crane School, Senior Boys' Department, Aspley, Nottingham.

SOUTHMINSTER—Mr. C. W. D. Brown, Reddings, Tillingham, Southminster, Essex.

WELLING—K. A. Fishenden, 98, Falconwood Avenue, Welling, Kent.

Branches Recently Incorporated

341. TURNFORD—Mr. P. Rice-Montagu, Brook House, Turnford, Broxbourne, Herts.
342. GLOUCESTER—Mr. A. J. Healey, B.A., 265, Stroud Road, Gloucester.
343. KEIGHLEY—Mr. N. Birtwhistle, 9, Bronte Street, Keighley, Yorks.
344. ENFIELD—Mr. J. W. Pettifer, 31, Goat Lane, Enfield, Middlesex.
345. ISLANDMAGEE—Mr. S. McCready, "Hillmount," Islandmagee, Co. Antrim.
346. COSHAM—Mr. W. H. Stuart, 71, Lodge Avenue, Cosham, Hants.

H.R.C. COMPETITION PAGE

TRACK LAYOUT CONTEST

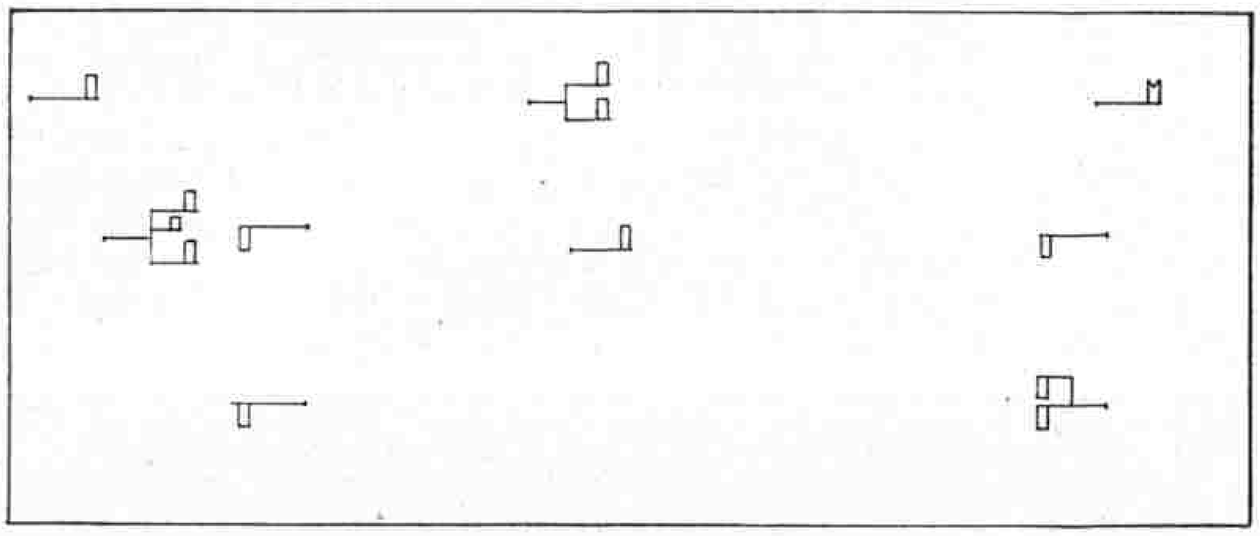
Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

It has often been said that a passenger in a British railway train is in the safest place in the world. The degree of safety will be appreciated when it is realised that according to recent figures the risk of fatal accident is 1 in every 25 million passenger journeys! This satisfactory state of affairs is due largely to the efficiency of the signalling system by which the movements of the trains are controlled.

To travellers other than railway enthusiasts the maze of signals frequently encountered at busy junctions or at terminal stations, seems very complex. To most H.R.C. members, however, who are able to recognize the various signals in use, the matter of "reading" them is comparatively simple, for each signal has a definite purpose and its location is in a sense a key to the track layout ahead.

It is with the idea of giving members a chance of showing their skill in this direction that we are this month introducing a novel and interesting competition based on the uses of signals. The accompanying illustration shows the positions of the signals necessary to ensure safe working over a section of track which includes a through station. The track itself has been omitted from the illustration, but the position of the signals should be a sufficient guide to the layout of the various roads, and competitors are required to find where these should be and thus to complete the drawing.



A railway layout without any rails! The positions of the signals form the clue to the track formation. Where should the various lines be placed?

The easiest method of accomplishing this is to make a rough copy of the signals shown in the illustration, and then to work out the layout step by step until a complete diagram has been obtained. When the competitor is sure that he has solved the problem, a neat copy should be made, on the back of which the competitor's full name and address and Hornby Railway Company number must be given.

Prizes to the values of 21/–, 15/– and 10/6 respectively of products manufactured by Meccano Limited will be awarded in order of merit to the competitors who give the three best solutions to this problem. In addition a number of consolation prizes will be awarded to those whose entries are not quite up to the standard of the prize-winners, but are worthy of recognition.

Envelopes containing entries should be clearly marked *"H.R.C. June Layout Contest"* in the top left-hand corner and posted to reach Headquarters at Meccano Limited, Binns Road, Liverpool 13, on or before 30th June. The closing date for Overseas entries is 30th September.

Railway Photograph Contest No. 3

Last month we announced the second of the Summer series of Photograph Contests in which competitors were invited to submit photographs of any railway subject. This month we give details of the third contest of this series. As in previous contests, there are no restrictions except that the actual exposure must have been made by the competitor himself; the developing and printing may be the work of a professional photographer.

Competitors may send in as many different prints as they desire but no competitor can win more than one prize in one contest. It is important that every print submitted should have on the back the name of the competitor, his full address and his Hornby Railway Company number, and a short description of the scene of the photograph should also be given. The best of the prize winning entries will be filed for possible use in future issues of the *"Meccano Magazine."*

The contest will be divided as usual into two sections, Home and Overseas, and prizes of any products manufactured by Meccano Limited, or photographic material if desired, to the values of 21/–, 15/– and 10/6 respectively will be awarded to the senders of the three best entries submitted in each section. In addition to the main prizes a number of consolation prizes will be awarded.

Envelopes containing entries must be marked *"H.R.C. Photo Contest No. 3"* in the top left-hand corner and should be posted to reach Meccano Limited, Binns Road, Liverpool 13, on or before 30th June. The closing date in the Overseas Section is 30th September.

Competitors who desire their entries to be returned should enclose a stamped addressed envelope of suitable size. Prize-winning prints become the property of Meccano Ltd. and are not returnable. We are expecting a record entry for this contest, as this time of the year offers splendid opportunities for excellent photographs to be obtained owing to the good light and the many special trains in service.

Each competitor is well advised once again to make certain that his name and full address is clearly written on each photograph submitted, as entries in these competitions are still sent in without these essential details.

COMPETITION RESULTS

HOME

March "Layout Contest."—First: F. Mills (31), Kearsley, Nr. Bolton. Second: C. E. Wrayford (6039), Bovey Tracey, Devon. Third: D. Coakham (28368), Upper Rathmines, Dublin. Consolation Prizes: R. A. Briars (53902), Newbury, Berks.; D. A. Cook (56536), South Woodford, London, E.18; P. S. Mason (56068), Carshalton, Surrey; H. Blake (58820), Hitchin, Herts.; H. Coulson (47536), Mansfield, Notts.

March "Errors Contest."—First: H. Coulson (47536), Mansfield, Notts. Second: F. Mills (31), Kearsley, Nr. Bolton. Third: J. W. Gahan (58544), Liverpool 13. Consolation Prizes: J. N. Crook (22414), West Kirby, Cheshire; H. J. Roberts (55803), Rock Ferry, Birkenhead; A. Searing (59145), Manchester 10; L. J. Payne (48450), Luton, Beds.; K. Fisher (45472), Bournemouth, Hants.; C. Dicker (55679), Burgess Hill, Sussex.

OVERSEAS

December "Names Contest."—First: D. J. White (9333), Christchurch, N.1, New Zealand. Second: D. Murison (37642), Buenos Aires, South America. Third: H. Clayton Key (24764), Calcutta, India. Consolation Prizes: W. B. Moore (20918), Ontario, Canada; R. A. Wragg (7913), Rajputana, India; W. S. Eagle (31779), Bombay, India; R. Corley (58586), Toronto, Canada; R. Pearson (29199), Victoria, Australia; J. M. Demanuele (44225), Valletta, Malta.

December "Jokes Contest."—First: W. A. Carpinter (42509), Christchurch, New Zealand. Second: R. Myburgh (37538), Cape Province, S. Africa. Third: A. Dionne (58583), Montreal, Canada. Consolation Prizes: J. M. Demanuele (44225), Valletta, Malta; R. Pearson (29199), Victoria, Australia; A. A. Shawky (53749), Egypt.

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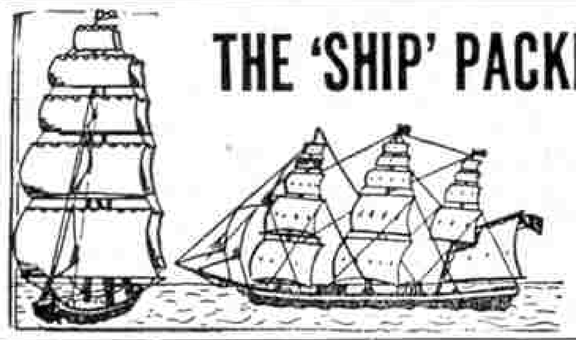

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Stamp Gossip

and Notes on New Issues

European-American Commemoratives

The tri-centenary of the founding of the Swedish Colony in North America on 8th April 1637 was celebrated in Sweden by the issue of a special series of five commemorative stamps, of 5, 15, 20, 30 and 60 öre values, with designs symbolising incidents in the foundation of the settlement.

The 5 öre value shows Johan Printz, the leader of the settlers, negotiating with an Indian Chief for the purchase of land on

which to found the settlement. The two ships *"Kalmar Nyckel"* and *"Fagel Grip,"* in which the colonists sailed from Gothenburg, are shown on the 15 öre stamp, while the 20 öre value depicts the landing of the colonists at a point on the Delaware River, where the town of Wilmington now stands. This design also shows the settlers driving into the soil a post bearing the Arms of Sweden while on the left a Red Indian smokes the pipe of peace. The 30 öre stamp gives a picture of the old Swedish Church, which still stands at Wilmington, and the 60 öre a portrait of Christina, Queen of Sweden from 1632 to 1654.

The 20 öre and 60 öre stamps are to remain on sale for six months, but the other three are to be withdrawn in June to make way for another commemorative issue celebrating the 80th birthday of King Gustav, who was born on 16th June 1858.

The great part played by the Polish General Kosciusko in America's fight for independence is recalled by the Polish 1z. stamp, illustrated here, issued to commemorate the 150th anniversary of the U.S.A. Constitution.

The design shows statues of General Kosciusko, George Paine and George Washington grouped under a rainbow arch, and at the foot of the arch a shadowy representation of the republican troops marching into the future, represented by a misty picture of the New York skyline.

First German-Austrian Stamp

A special stamp commemorating the union of Austria and Germany was issued simultaneously in both countries on 10th April on the occasion of the plebiscite taken in Austria to secure the people's approval. The design of the stamp shows two male figures, intended to suggest brothers, one a member of the German Nazi Party and the other an Austrian, with arms around one another's shoulders and bearing between them a swastika banner. Labels running around the stamp read *"One People, One State, One Leader, 10 April 1938."* Across the foot is the customary inscription *"Deutsches Reich."* The stamp circulated in Germany has a face value of 6 pf., while its Austrian companion is denominated 9 gr. Both stamps are to remain valid until 31st December.

Special propaganda postmarks were used during the early days immediately following the German coup. One, referring to the plebiscite, superimposed on a swastika, read *"On 10th April your 'Yes' for the Leader."* Another used in Vienna on 9th April only, and illustrated here with the plebiscite stamp by courtesy of our Vienna agent, Mr. Hans Krainer, reads *"Day of the Greater German State—Vienna 9th April 1938"* around a large circle, the centre of which is filled by a map of the new Germany.

Ordinary German stamps of current value became available for general use in Austria on 4th April.

Peasant Costume Designs

We illustrate here the four designs used for the miniature stamp sheets issued at the Belgrade Stamp Exhibition in September last. The four designs show Jugo-Slavian national costumes as follows: 1d., Serbian girl; 1d.50, Bosnian girl; 2d., Slovenian girl and 4d., Croatian girl. The miniature sheets were only obtainable at the Exhibition.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

Summer Stamp Collecting

There is a big temptation for young stamp collectors to neglect their stamp collections during the summer months. Nevertheless, it is a big mistake to put the stamp collection aside and forget it altogether until the winter comes along, and this year there are many special reasons why contact with the hobby should be maintained. For example, the flow of new British Colonials is now reaching its full strength, and will continue for two or three months. Although the majority of these stamps are permanent issues that will remain on sale for some time, the collector should keep himself posted with details as these stamps appear, otherwise he will find it difficult to catch up with them at a later stage. This applies also to commemorative issues if they are neglected for two or three months.

Readers therefore should make a firm resolution to give their stamps a little time each week during the outdoor season. The effort to make the opportunities will be well repaid.

Belgian Charity Series

The Belgian charity series illustrated here shows King Leopold in flying kit in the cockpit of his private machine. It is,

we think, the first time a stamp design has shown a reigning monarch in this guise.

The series consists of five stamps each using the same design and bearing a premium for Belgian aeronautical charities. The back-ground of the design includes the badge of the Belgian Air Force in the top right corner.

Dutch Summer Charity Issues

The designs for this year's Dutch Summer Charity issues will comprise portraits as follows: 1½c., Marnix van Sint Aldegonde; 3c., O. G. Heldring; 4c., Maria Tesselschade; 5c., Rembrandt; 12½c., Boerhaave.

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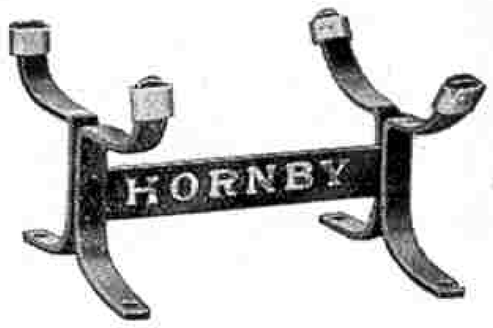

Every owner of a Hornby Speed or Racing Boat who prides himself on taking care of his model should obtain a Hornby Boat Stand on which to place his boat when it is not in use. The Stands are available in the following sizes: No. 1 for No. 1 Speed Boats; No. 1R for No. 1 Racer; No. 2 for No. 2 Speed Boat and No. 2 Racer; No. 3 for Nos. 3, 4 and 5 Speed Boats and No. 3 Racer. They can be obtained from any Meccano dealer price 9d. each (any size).

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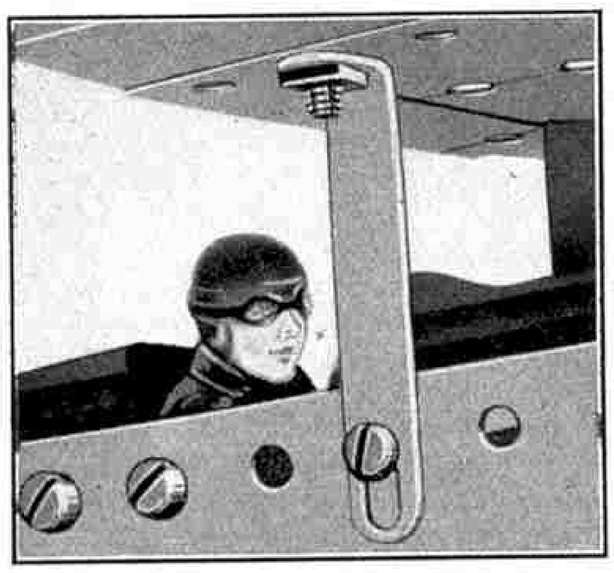

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New British Colonial Issues

This month we are able to announce details of a further range of Colonial stamps of the new reign. The most interesting of this month's series is the set from Fiji, from which we have chosen for reproduction the ½d. and 2d. values, showing respectively a native sailing canoe and a map of the Fiji Islands. The remaining designs are as follows: 1d., native village; 1½d. and 3d., views of native sailing canoes (the 3d. stamp shows also the Colony's Coat of Arms in an oval panel in the top left corner of the stamp, facing the King's portrait in the top right corner); 5d., field of sugar cane; 6d., map of the Islands; 1s., a native spearing fish at night with the aid of a torchlight (the light attracts fish to the surface of the water, where they present an easy target); 2s., Suva Harbour; 2s. 6d., a river scene; 5s., house of a native chief. Excluding the Silver Jubilee and Coronation issues, this is Fiji's first pictorial series and we are sure readers will agree that it is a splendid one.

We illustrate also the ½d. value of the new Gold Coast series. This design, showing Christiansborg Castle at Accra, is used for the eight low values from ½d. to 9d., while another view of the castle in upright format, is used for the three high values 1s., 2s. and 5s.

Bahamas have retained the simple portrait type that was the common style of British Colonial stamps for so many years. The design is identical for each of the three values, ½d., 1d. and 2½d., issued to date, and is illustrated in the heading on page 355.

Grenada has retained its existing designs with the substitution of the portrait of King George VI for that of King George V. We illustrate the 1d. value, which shows the Badge of the Colony as the pictorial feature. The Badge is also the main feature of the newly introduced 10s. value, but this stamp has struck a distinctive note by featuring the Imperial Crown and Cipher in the upper left and right corners of the design in place of the King's portrait, which could not be included without unbalancing the design of the stamp.

The Swaziland design to which we referred in last month's notes is also illustrated here, and we think readers will agree that this is a great improvement on the old design. It is used for all values from ½d. to 10s.

Finally we show the new design for New Zealand's ½d. value in the heading on page 355. This has a squared-up portrait of King George VI within a frame of Maori carving.

Unfortunately specimens of Australia's new 5s. and 10s. stamps were not available for reproduction at the time of going to press. Although these stamps are not intended to serve as Coronation Commemoratives, as was thought previously, they portray Their Majesties in full Coronation robes, King George being shown on the 10s. stamp and Queen Elizabeth on the 5s. stamp. The designs show Their Majesties standing by their thrones facing left.

The British Solomon Islands are to have an entirely new issue, comprising 12 values with designs featuring subjects of local interest, as follows: ½d., native spears and shield; 1d., native policeman and an old chief; 1½d., Auki Island; 2d., canoe and house; 2½d. and 3d., Roviana canoe; 4½d., native house; 6d., coconut plantation; 1s., breadfruit; 2s., Tinakula; 2s. 6d., Megapodes, and 5s., canoe. All of the designs will include a portrait of King George VI.

Centenary of the "Penny Black"

No official pronouncement has yet been made as to plans for the celebration of the centenary of Britain's introduction of the first postage stamps, which falls in 1940. There is therefore no certainty that the occasion will be marked by a British commemorative stamp.

Whatever British plans are made, however, it is clear that other nations intend to share the celebration. That is inevitable, for the centenary has an international significance as the outstanding event in postal history. Both France and the United States of America have signified their intention to issue special stamps and, with so powerful a lead, it may be expected that many other countries will do the same.

Nevertheless, stamp collectors in Britain and elsewhere are not happy as they regard the prospect of a huge flood of commemoratives. After all there is a limit to what the stamp collecting world can absorb, and those countries that derive no small part of their postal revenue from the sale of new issues to collectors, and who feel tempted to exploit this occasion, might well pause to consider the fable of the goose that laid the golden eggs.

New Canadian Designs

The completion of Canada's series of King George VI stamps is announced to take place on 15th June, when four new pictorial stamps, 10c., 20c., 50c. and $1 values, will be issued with designs as follows: 10c., Memorial Chamber, Peace Tower, Parliament Buildings, Ottawa; 20c., Fort Garry Gate, Winnipeg; 50c., Entrance, Vancouver Harbour; $1, Chateau de Ramezay, Montreal.

Simultaneously there will be issued a new 6c. Air Mail stamp, with a design showing a scene on the Mackenzie River, Northwest Territories, and a 20c. Special Delivery stamp with a design consisting of the Canadian Coat of Arms.

We hope to reproduce these new designs in our next issue.

United States "Presidents" Series

The White House at Washington, the official residence of the Presidents of the United States, appears on a postage stamp for the first time in the new regular series of U.S. stamps, the first values of which are now appearing. The White House is to appear on the 4½c. value.

The full series is designed to give a complete chronological record of Presidents from George Washington to Calvin Coolidge. By the addition of certain new values the portrait of each of the first 22 Presidents actually appears on the stamp whose face value coincides with the order of his term of office. Thus George Washington, the first President, appears on the 1c. value, John Adams, the second President, on the 2c., Jefferson, the third President, on the 3c., and so on up to Cleveland on the 22c.

There are two "non-president" features in the series, apart from the White House stamp. These are the ½c. and 1½c. values, showing respectively portraits of Benjamin Franklin, founder of the American postal system, and Martha Washington, wife of George Washington. Martha Washington played a great part in the success of her husband's administration and her name has been honoured throughout American history.

The complete set of 32 denominations will bear designs as follows: ½ cent, Benjamin Franklin; 1c., George Washington; 1½c., Martha Washington; 2c., John Adams; 3c., Jefferson; 4c., Madison; 4½c., White House; 5c., Monroe; 6c., John Quincy Adams; 7c., Jackson; 8c., Van Buren; 9c., William H. Harrison; 10c., Tyler; 11c., Polk; 12c., Taylor; 13c., Fillmore; 14c., Pierce; 15c., Buchanan; 16c., Lincoln; 17c., Johnson; 18c., Grant; 19c., Hayes; 20c., Garfield; 21c., Arthur; 22c., Cleveland; 24c., Benjamin Harrison; 25c., McKinley; 30c., Theodore Roosevelt; 50c., Taft; $1, Wilson; $2, Harding; $5, Coolidge. The list, it will be seen, features every past President except Herbert Hoover, who is still living. It is part of American law that living ex-Presidents may not be featured on postage stamps.

The designs of the new stamps should prove exceedingly popular for in conformity with modern ideas, they have been stripped of all minor embellishments. Each stamp will show a simple portrait on a plain ground, relieved only by the name of the President, dates indicating the period in which he held office, the words "United States Postage," and the value across the foot.

The first of the new stamps, the 1c., was placed on sale for the first time at Washington on 25th April, prior to general release on the following day. The 1½c. was first placed on sale also at Washington, on 5th May, and the ½c. appeared first at Philadelphia on 19th May. The 2c. is to appear on 3rd June with first day sales at Washington.

Railway Travel in Malaya

By W. E. WINFORD

Long distance travel by rail in the East is apt to be very uncomfortable owing to the heat and dust, and most travellers change into khaki shorts and a thin shirt for a journey. Even then they arrive at their destinations feeling tired and dirty, as I know from bitter experience.

Conditions of travel on the Railways of Malaya have been much improved recently, however, by the introduction of air-conditioned coaches, in which a temperature of 79 deg. F. is maintained. The air is kept at a humidity judged to be the most pleasant, double windows exclude dust, and the use of tinted glass prevents glare from the Sun. On the completion of a 200-mile run in one of these coaches I felt quite as fresh and clean as when I started.

The locomotives used on the Malayan Railways are powerful "Pacifics" of magnificent appearance, and trains occasionally attain quite high speeds. Average speeds are comparatively low, however, for the country is hilly, while the track is of narrow gauge and has many sharp curves.

The most common sight from a train in Malaya is the rubber plantation, for rubber is the chief product of the peninsula, but in certain districts there are tin mines. The tin ore is won from the excavated earth by washing it with water down a series of long narrow troughs from a height. The heavy ore settles, while the lighter earth and gravel is carried away by the water.

A Soda Lake in Kenya

By W. F. HODGE

Recently I motored to Lake Hannington, which lies tucked away in the Great Rift Valley, Kenya. This valley is a native reserve, and we had to obtain a special Government permit to enter; in addition our party had to consist of not less than two cars.

We left for the Lake at about 10.30 a.m., and soon the road we were on petered out, becoming a mere grass track. At about 2 o'clock we reached some wells where natives were watering their cattle, and as the track finished there, had to enlist the services of guides to show the way to the Lake.

Eventually we arrived at the foot of a steep hill, where we left the cars and proceeded on foot, and about a mile from the top of the hill we came to the edge of a high cliff overlooking the Lake. This lies in a hollow formed by hills that tower all round to a height of more than 1,000 ft. above its surface, and its waters contain soda dissolved in them. It seemed to be about 10 miles long and 5 miles broad in its widest part, but the most striking feature was the number of flamingos on its banks. There must have been many thousands of the strange birds, which stand over 4 ft. high on their long thin legs, and have slender sinuous necks curving upward like a capital letter S, to end in a very small head. They are of a bright pink or even scarlet colour, and they were so thickly crowded together along the border of the lake that it seemed to be covered with a pink carpet.

We stayed for some time, watching the strange scene, and were sorry when we had to leave.

The Pierhead at Liverpool from the bridge of a liner alongside the Landing Stage, showing the bridges from the Pierhead to the floating stage. Photograph by courtesy of the Mersey Docks and Harbour Board.

Britain's Water Highways—

(Continued from page 331)

and, of course, this meant taking a much longer time and using even more energy.

Passing places have been provided in tunnels, and it is recorded that often these were the scenes of violent fights between bargemen. It can readily be understood that the crew of a barge held up for some time in one of these places awaiting another boat to come through the "narrows" would not be in the best of tempers.

When a river valley had to be crossed a canal was carried across by an aqueduct, and many of these are wonderful structures. Between Romiley and Marple there is one that crosses the Goyt Valley, and to walk along the towing path with only a low wall separating one from an immense drop is a fascinating experience. Even more romantic is the aqueduct that carries the Shropshire Union Canal across the Dee Valley near Chirk, for there a low parapet separates the towing path from a drop of 150 ft.

The most famous aqueduct, however, is at Barton, some five miles outside Manchester. There the one erected by Brindley has had to be replaced by a new one, as it did not allow headroom for sea-going vessels passing up and down the Manchester Ship Canal, the course of which lies below it. The new structure is a swing bridge and the water on it is cut off from the canal by gates when it has to be opened.

A Motor Boating Magazine

Motor boating is a very popular summer pursuit nowadays, and there is a good range of cruisers available for those who enjoy it. The hobby or recreation is not necessarily an expensive one, however, for outboard motors can be obtained at little expense with which to transform a canoe or dinghy, or some larger type rowing or sailing vessel, into a motor boat with which healthy and happy holidays can be enjoyed.

All who are interested in this comparatively new recreation will enjoy reading "*Pleasures Ahoy!*" a magazine for all who enjoy life on the sea, on rivers or on lakes. Each issue contains interesting articles on motor boat cruising and similar topics, and on the engines of various types with which the boats are equipped, and is well illustrated. A copy will be sent free to any "*M.M.*" reader who writes to the British Motor Boat Manufacturing Co. Ltd., Britannia House, Ampton Street, London W.C.1, mentioning the "*M.M.*"

"Bond's Model Handbook"

Bond's O'Euston Road Ltd. have supplied the wants of the model engineer for over 50 years, and the range of their stock, one of the most comprehensive in the world, is well shown by the contents of their 1938 Model Handbook, the second edition of which has reached us. The model engineer, whether he is interested in railways, ships, aeroplanes, internal combustion engines or any other branch of engineering, will find in it the tools, materials and parts he requires, together with details of many finished models, constructional kits and blueprints.

The large range of tools listed includes such special workshop equipment as lathes, milling and shaping machines, and electric motors to drive them. A full stock of parts and fittings for incorporation in model boats of all kinds is described and aeroplanes and aeroplane model construction are dealt with equally comprehensively. There is a profusion of locomotives and rolling stock for model railway layouts of gauges from OO to 7½ in., together with parts and mechanisms for building up models of the enthusiast's own design and construction.

The book also contains useful hints and tips compiled by members of the staff of Bond's, and has a full index. Its price is 6d., and copies may be obtained direct from Bond's O'Euston Road Ltd., 357, Euston Road, London N.W.1.

Advice on Home Photography

Readers who have found this month's photographic article interesting, and have decided to do their own developing in future, will find it well worth while to obtain the series of five free booklets offered by our photographic advertisers Johnson and Sons Ltd.

The series is entitled "*Home Photography*," and each booklet deals with one particular feature of photographic finishing, the respective topics being development, gaslight printing, making bromide prints, enlarging and flashlight photography. Each has been written by an expert in the particular branch of photography of which he writes, and the booklets form a most valuable little library for any young photographer.

Johnson and Sons Ltd., Dept. E/M. Hendon, London, will send this series of booklets, together with a copy of another publication dealing with their photographic chemicals, to any reader who writes to them, mentioning the "*M.M.*"

Bluemel "Ultralight" Mudguards

Even the most optimistic cyclist hardly dare hope that he will get through a season's cycling without encountering a few wet hours, and on such occasions efficient mudguards are essentials to comfort. Readers who are contemplating a renewal would be well advised to see the new Bluemel "Ultralight" mudguards. These have fittings of aircraft metal and are approximately 6 oz. lighter than the average celluloid guards, and 18 oz. lighter than some standard roadster type steel guards.

Bluemel Bros. Ltd., Wolston, Nr. Coventry, will send full details, free of charge, to any "*M.M.*" reader.

A New Burroughs Wellcome Booklet

Burroughs Wellcome and Co. have just issued a new booklet, under the title "*Modern Photographic Development*," in which the whole process of picture-making with the camera is described step by step. Particular attention is given to the subject of development with "Tabloid" chemicals, the well-known special products of the firm designed to simplify the "messy" business of compounding developing solutions.

Messrs. Burroughs Wellcome and Co., Snow Hill Buildings, London E.C.1, will be glad to send a copy of this booklet free to any "*M.M.*" reader who writes to them.

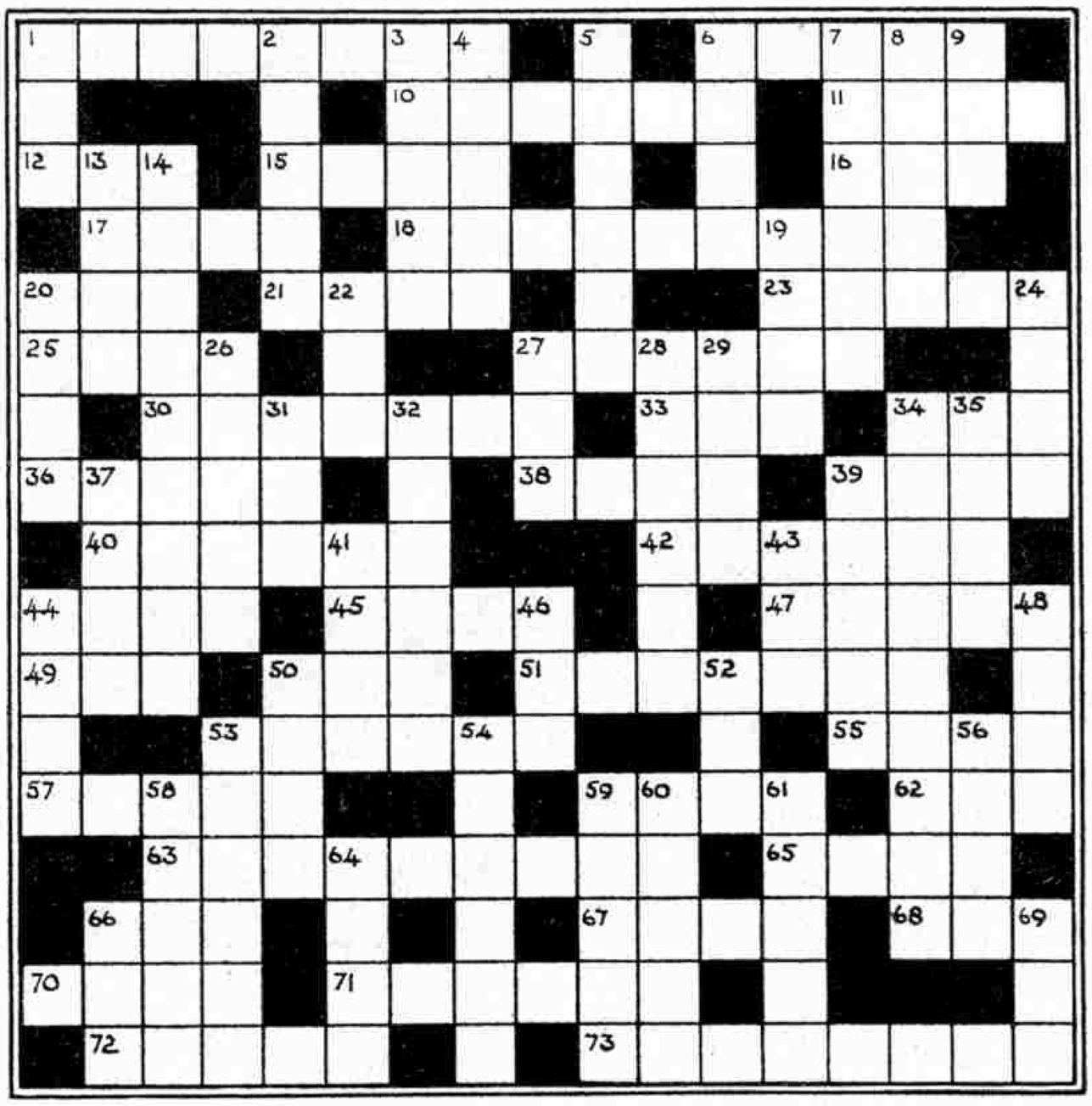
Pifco Spring Catalogue

Cycling readers, and those who revel in motoring picnics, should not fail to obtain a copy of the Pifco Spring Catalogue. It contains several pages devoted to the company's cycling equipment, bells, horns, lamps, chains, clothing and, most interesting of all, a splendid range of light picnic and luncheon cases specially designed for cyclists and motorists.

Copies of the catalogue can be obtained free of charge by "*M.M.*" readers from Pifco Ltd., Watling Street, Manchester.

Competition Corner

JUNE CROSSWORD PUZZLE



CLUES ACROSS

1. Original copy
6. Bury
10. Restful bed
11. Mountain range
12. Turn out of course
15. Quantity
16. Stomach
17. Breakwater
18. Ignorant person
20. Mountain
21. National flower
23. Watchful
25. Terminals
27. Dexterous
30. Everlasting
33. Limit
34. Study carefully
36. Protective covering
38. Infant
39. Small inlet
40. Timid
42. Britain's Dominions
44. Adhesive
45. Condemnation
47. Bone-like substance
49. Evil
50. Kind of lettuce
51. Poison
53. Aptitude
55. Doubled cord
57. Tree
59. Demands
62. Sharp blow
63. Alteration
65. Encounter
66. End
67. Stare
68. Retiring
70. Attitude
71. Policeman
72. Nest
73. Thrusts back

CLUES DOWN

1. Work at steadily
2. Command
3. Fertile spot
4. Feudal vassal
5. In foreign parts
6. Notion
7. Uproar
8. Efface
9. In a natural state
13. So be it
14. Strange
19. Servant
20. Letter of Greek alphabet
22. Propels a boat
24. Adjust
26. Hoard
27. Clerical vestment
28. Revolts
29. A group or species
31. Girl's name
32. Full of knots
34. Malay boats
35. Above
37. Become wearisome
39. Polite
41. Image
43. Fasten
44. Yield
46. Lustreless
48. Leather binding
50. Anxiety
52. Largest deer
53. Moderate
54. Count
56. Solemn declaration
58. Flower
59. Irritate
60. Look fixedly
61. Daub
64. Back of the neck
66. Part of the body
69. Affirmation

This month we give another of the popular *"M.M."* crossword puzzles, which are intended for amusement rather than strenuous competitive effort. This month's puzzle will be found to follow the lines of those set in previous issues. It is fair and interesting, and the clues are all perfectly straightforward. Every word used can be found in Chambers' or any other standard dictionary.

Prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded in order of merit to the senders of the four correct solutions that are neatest or most novel in presentation. Prizes of the same value will be awarded in the Overseas section, which is open to all readers living outside Great Britain, Ireland and the Channel Islands.

Entries should be addressed *"June Crossword Puzzle,* Meccano Magazine, Binns Road, Liverpool 13," and must be sent to reach this office not later than 30th June. Overseas readers' entries must arrive not later than 30th September.

June Photo Contest

As announced in the April *"M.M.,"* we are holding a photographic contest each month throughout this summer. The conditions of the competitions are exceptionally simple, and are designed to make it possible for every reader to take part. The only requirements are that the exposure must have been made by the competitor himself and each print must bear a title.

Each month's entries will be divided into two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products or photographic material, as chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section.

Entries to this month's competition should be addressed *"June Photo Contest,* Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 30th June. Overseas closing date, 30th September.

Competition Closing Dates

HOME		
June Crossword Puzzle	...	**30th June**
June Photo Contest	... ...	**30th June**
OVERSEAS		
March Drawing Contest	...	**30th June**
March Crossword Puzzle	...	**30th June**
"Golfwords" Contest	... ...	**30th July**
April Photo Contest	... ...	**30th July**
Text XI Voting Contest	...	**30th July**
Test XI Voting Contest (Australia and New Zealand only)		**31st August**
May Photo Contest	... ...	**31st August**
June Crossword Puzzle	...	**30th September**
June Photo Contest	... ...	**30th September**

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group, as age allowances are given to ensure equality of opportunity for the younger competitors.

COMPETITION RESULTS

HOME

"April Golfwords Contest."—1. J. G. Turnbull (Ilford). 2. H. G. Johnston (Southall). 3. H. C. A. Houston (Edinburgh, 4). 4. C. E. Wrayford (Bovey Tracey, Devon). Consolation Prizes: W. C. Hannan (Glasgow, E.1); J. C. Button (Crewe); E. P. Kingdon (Exeter); C. H. Noble (Macclesfield); N. L. Baker (Liverpool, 13); J. Porter (Wolstanton, Staffs.).

"April Photo Contest."—First Prizes: Section A, J. R. Tottle (Taunton); Section B, J. D. Bower (Malden). Second Prizes: Section A, A. B. Bishop (Bristol, 4); Section B, P. G. Lund (Leicester). Consolation Prizes: G. W. Keen (Ulverston); J. L. Graves (Stone); R. Bald (Blackwater); J. Norris (Worcester); F. Miller (Oldham); J. T. Cosgrove (High Wycombe).

OVERSEAS

"January Cover Voting Contest."—1. C. P. Barnard (Johannesburg). 2. B. Spencer (Big Valley, Alberta). 3. R. Dumont (Quebec). 4. L. P. Chapman (Dunedin, S.2). Consolation Prizes: P. C. Odlin (Epsom, S.E.1, Auckland); E. Kewney (Pietermaritzburg); A. A. Shawky (Orman, Egypt); R. W. Barbey (Vaud, Switzerland).

"January Drawing Contest."—First Prizes: Section A, P. Halbwachs (Curepipe, Mauritius); Section B, R. J. Dickison (Dunedin, N.W.1). Second Prizes: Section A, H. Dixon (Auckland, New Zealand); Section B, J. W. A. Ohiwerei (Ibadan, W. Africa).

AIMING HIGH

"My boy wants larnin'," said the cowboy to the schoolmaster. "What d'ya teach?"

"English, spelling, algebra, trigonometry and science," replied the teacher.

"Well, give him some of this trigger-nometry—he's the worst shot in the family," said the cowboy.

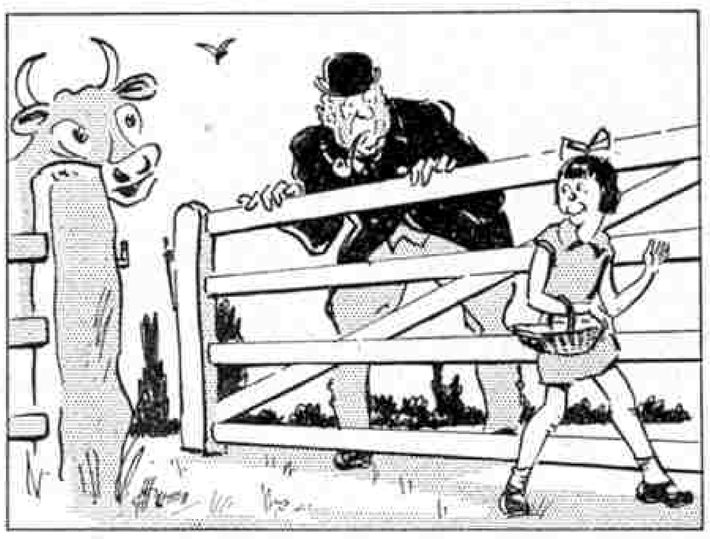
* * * *

"What was the best job you ever did?" inquired the first barber.

"I once shaved a man," replied the second barber, "and then persuaded him to have a hair-cut, shampoo, facial massage, singe, tar-spray and tonic rub. By that time he needed another shave."

* * * *

ARTFUL



A little country girl was standing before a closed gate. Presently the Squire appeared.

"Oh, please, sir," said the little girl, "will you kindly open the gate for me?"

The Squire did so, and then said: "And why, my child, couldn't you open the gate yourself?"

"Because the paint isn't dry yet," replied the girl.

* * * *

Jump: "Did you ever feel that the whole world was against you?"

Bump: "Yes, this morning when I slipped on the pavement."

* * * *

Dad: "No, I won't buy you a trumpet. You'd disturb me too much with it."

Jack: "I wouldn't, Dad. I'd only play it while you were asleep."

* * * *

Teacher: "Now Andy, give me a sentence containing the word 'seldom'."

Andy: "My father had two goats, and he 'seldem'."

* * * *

The old lady had received a telegram, and next day went to the Post Office and asked to see the Postmaster.

"I've just called to compliment you on your service," she said. "Yesterday I received a telegram all the way from London, and when I opened it the gum on the envelope was still wet!"

* * * *

"Does my practising make you nervous?" asked the man who was learning to play a saxophone.

"It did when I first heard the neighbours discussing it," replied the man next door, "but now I don't care what happens to you."

* * * *

A Cornish maid went to see her doctor because her throat was sore.

"Well," asked her mistress when she returned, "what did the doctor say?"

"Please, ma'am," replied the maid, "he said both my tonsils are badly in flames."

* * * *

A youngster who was in the habit of saying "ain't" for "isn't" was reproved by his father.

A short time afterwards, on hearing his cousin use the same word, the boy ran to his father and exclaimed: "Dad, Ted says 'It ain't', but it isn't 'ain't,' is it? It's 'isn't,' ain't it?"

THIS MONTH'S HOWLER

Gravity was discovered by Isaac Newton. It is chiefly noticed in the autumn when the apples are falling off the trees.

* * * *

"Congratulate me, old boy. I've won a prize at our local flower show."

"Good! What for?"

"Guessing the weight of a cake."

* * * *

Two old farm workers were studying a railway timetable outside the local station.

"What do A.M. and P.M. at the top mean, Garge?" asked Bill.

"That means 'apenny a mile and penny a mile."

* * * *

A local train was pulling out from the platform when a young man, almost exhausted, just managed to tumble into a compartment and seat himself, panting and puffing, opposite an old gentleman.

The latter looked on with disapproval.

"You must be unfit, young man," he said. "When I was your age I never panted like that after a short run."

"Perhaps not," retorted the youth, regaining his breath: "but I missed the train at the last station."

* * * *

Teacher: "Remember, children, no one can reach success without starting at the bottom and working up."

Voice from rear: "But what about a parachute jumper?"

* * * *

Mother: "I've told you, Jack, to wait for your elders to stop speaking before you begin."

Jack: "I've tried that, Mummy; but they never do."

* * * *

Mike: "Begob, Pat, I was too clever for that customer. He tried to pass a bad half-crown on me."

Pat: "And you gave it back to him?"

Mike: "Yes, I mixed it up with the pennies in his change."

* * * *

Wife: "The roof is leaking and the builder wants £2 to repair it."

Husband (greatly distressed): "Oh, dear, I wanted to save that money for a rainy day."

* * * *

"Hi! You dropped a brick!" yelled a pedestrian on whose shoulder the brick had fallen from a fourth-storey scaffold.

"All right," cheerfully responded the bricklayer. "You needn't trouble to bring it up."

* * * *

Bob: "I understand you bought this car for a song."

Jim: "Well, not exactly a song. Merely a collection of notes."

* * * *

QUICK WORK

Two men were working at the top of a tall building, when they heard the sound of a bell from the street below.

"Ambulance, Bill," remarked one.

"Blimey!" exclaimed the other. "I only dropped my hammer a minute ago!"

A BLACK LOOKOUT

Magistrate: "This is the fourth time you've been here for stealing chickens. What's your explanation?"

Thief: "The night wasn't dark enough."

* * * *

Joe: "Great Scott! I've forgotten who wrote 'Ivanhoe'."

Fred: "I'll tell you if you tell me who the dickens wrote 'A Tale of Two Cities'."

* * * *

An Irishman used to feed his pig one day and starve it the next. On being asked the reason for doing so, he replied:

"Och, sure, an' isn't it that I like to have bacon with a strake o' fat an' a strake o' lane?"

* * * *

MAKING TRACKS

The Chinese cook of a Wild West camp suddenly saw a big brown bear eagerly following his tracks in the snow.

"You likee my tracks," he exclaimed, "I makee more."

* * * *

Jimmie: "My dog took first prize at the cat show."

Johnnie: "How could that be?"

Jimmie: "He took the prize cat."

* * * *

"Now children," said the stout schoolmistress, "at home I have a canary, and it can do something I cannot do. I wonder if any of you know just what that is?"

"I know, teacher," replied little Willie brightly. "Take a bath in a saucer."

* * * *

"That man's business is on the rocks."

"Really! What does he do?"

"Builds lighthouses."

* * * *

Butler (hearing noises in library). "Is that you, my lord?"

Burglar: "Yes, mate."

* * * *

A little boy, after his first day at school, was questioned as to what happened.

"Nothing much," he said, "except that a lady there didn't know how to spell 'cat.' She asked me how, and I told her."

* * * *

Robbie (going to bed): "Mother, need I brush the tooth the dentist is going to pull to-morrow?"

* * * *

Newsboy: "Great swindle. Seventy-four victims."

Gent. (buys paper and reads headlines): "I can't see anything about a swindle."

Newsboy: "No, you can't. That is the swindle. You're the seventy-fifth victim."

* * * *

Jack: "And is Jim as fat as ever?"

Bill: "Fat! Why, he had mumps for three weeks before we knew it."

* * * *

"How is it that the potatoes at the top of the bag you sold me last week were so much larger than those at the bottom."

"Well, potatoes is growin' so fast now, by the time I get a basketful dug, the last ones is about twice the size of the first."

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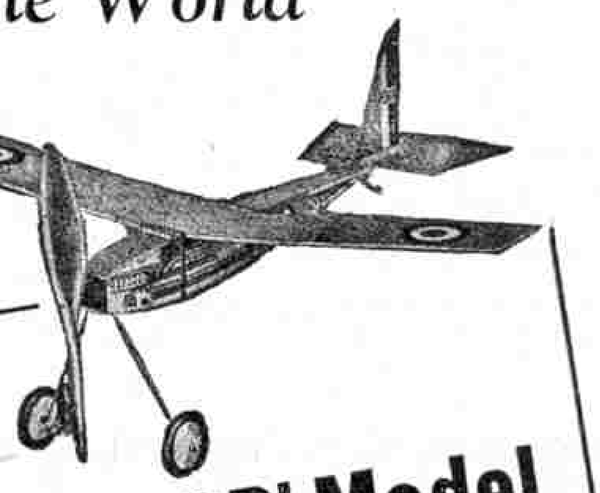

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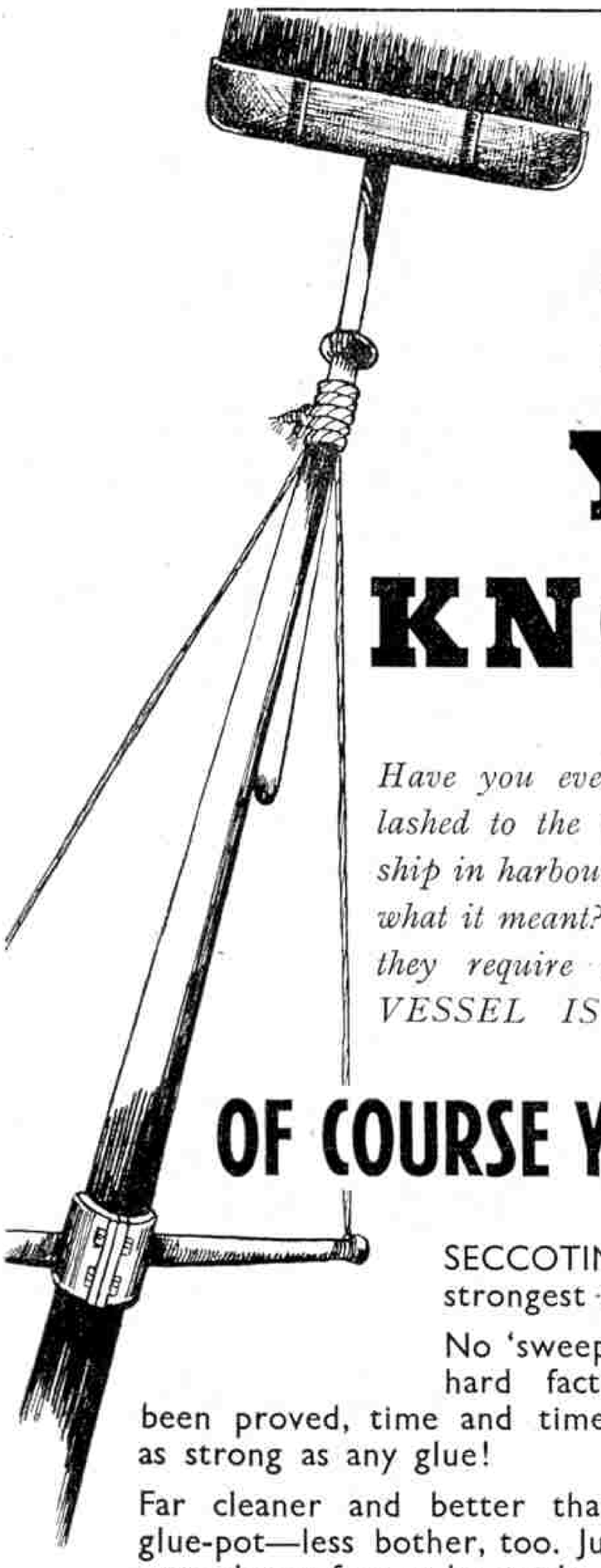

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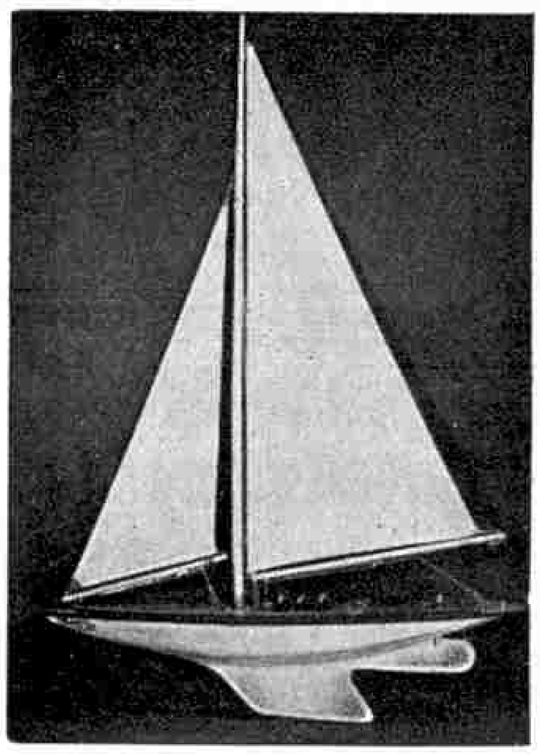

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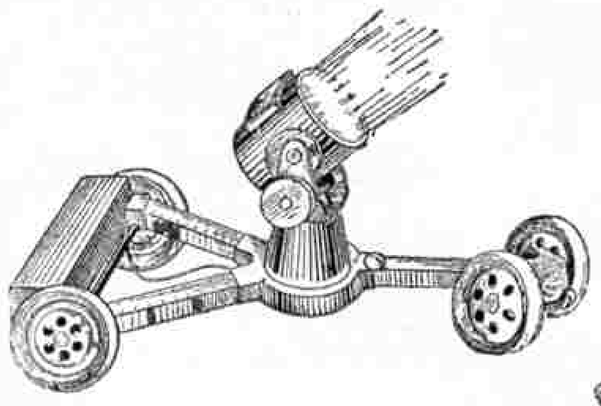

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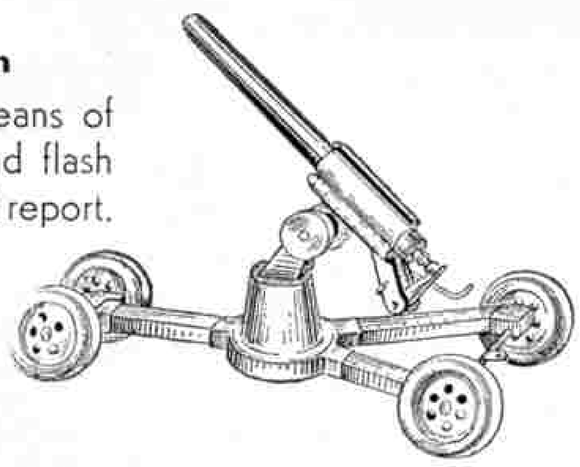

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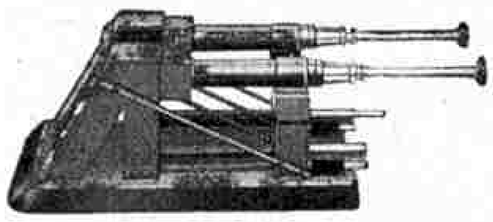
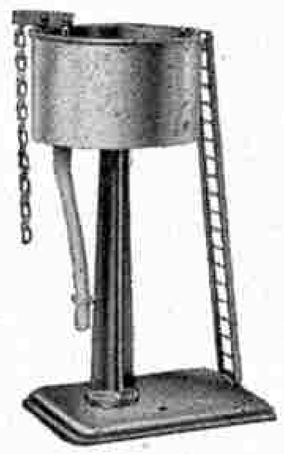


No. 2 BUFFER STOPS
Hydraulic type. Price **4/11**



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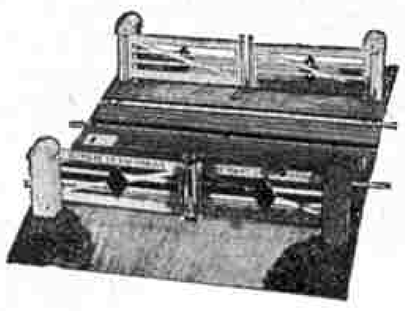

No. 2 LEVEL CROSSING
Measures 13½ x 10½ in., with two gauge O tracks in position.
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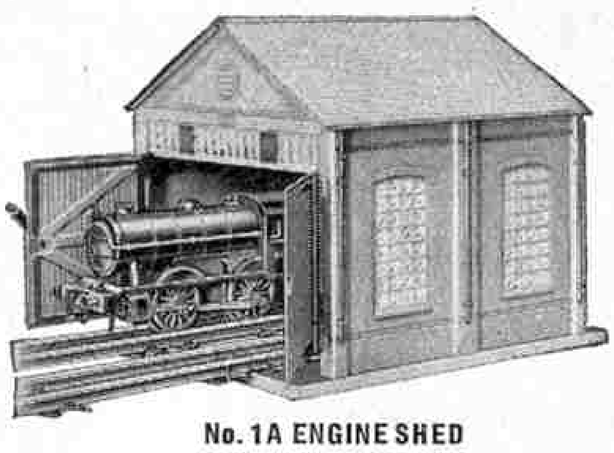

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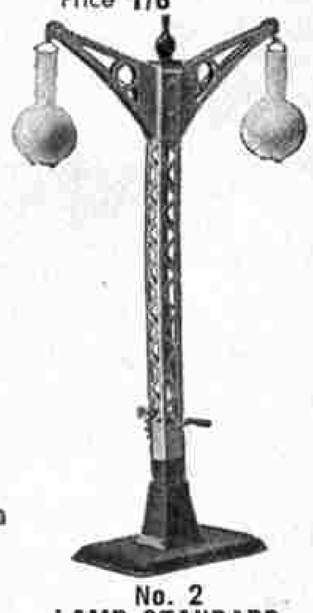

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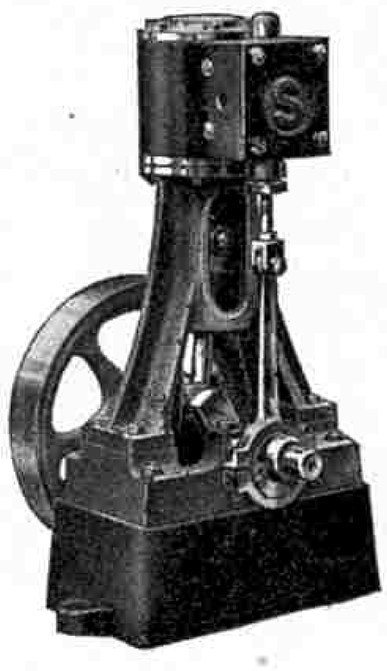

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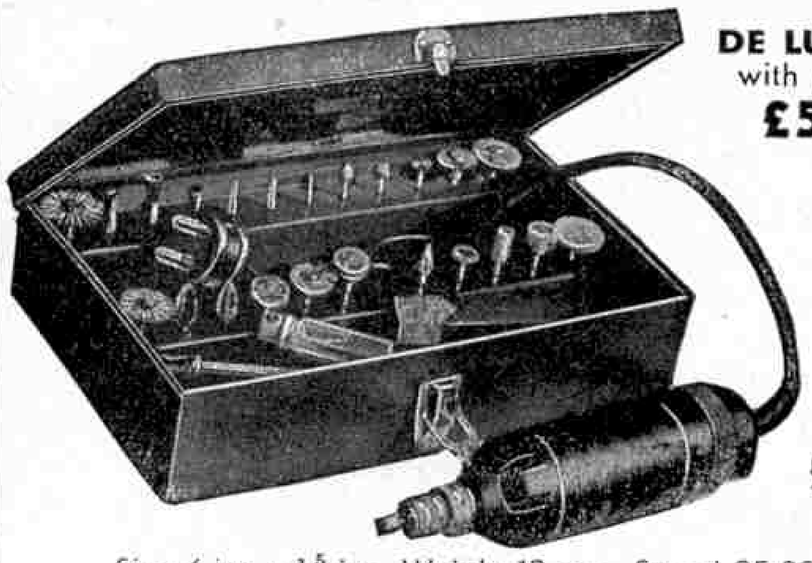

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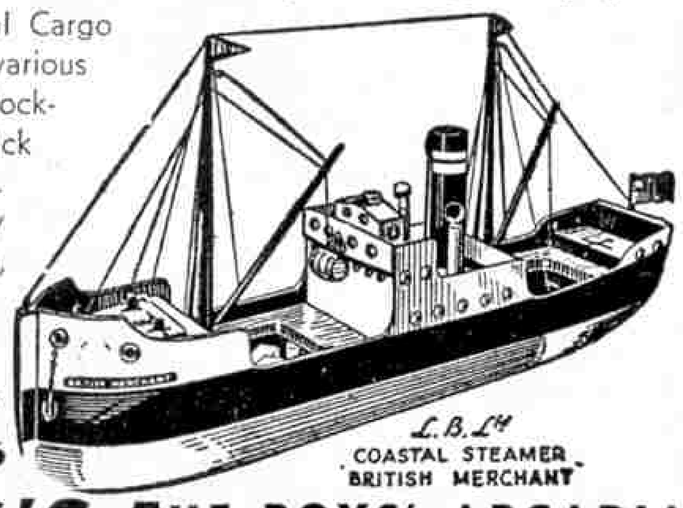

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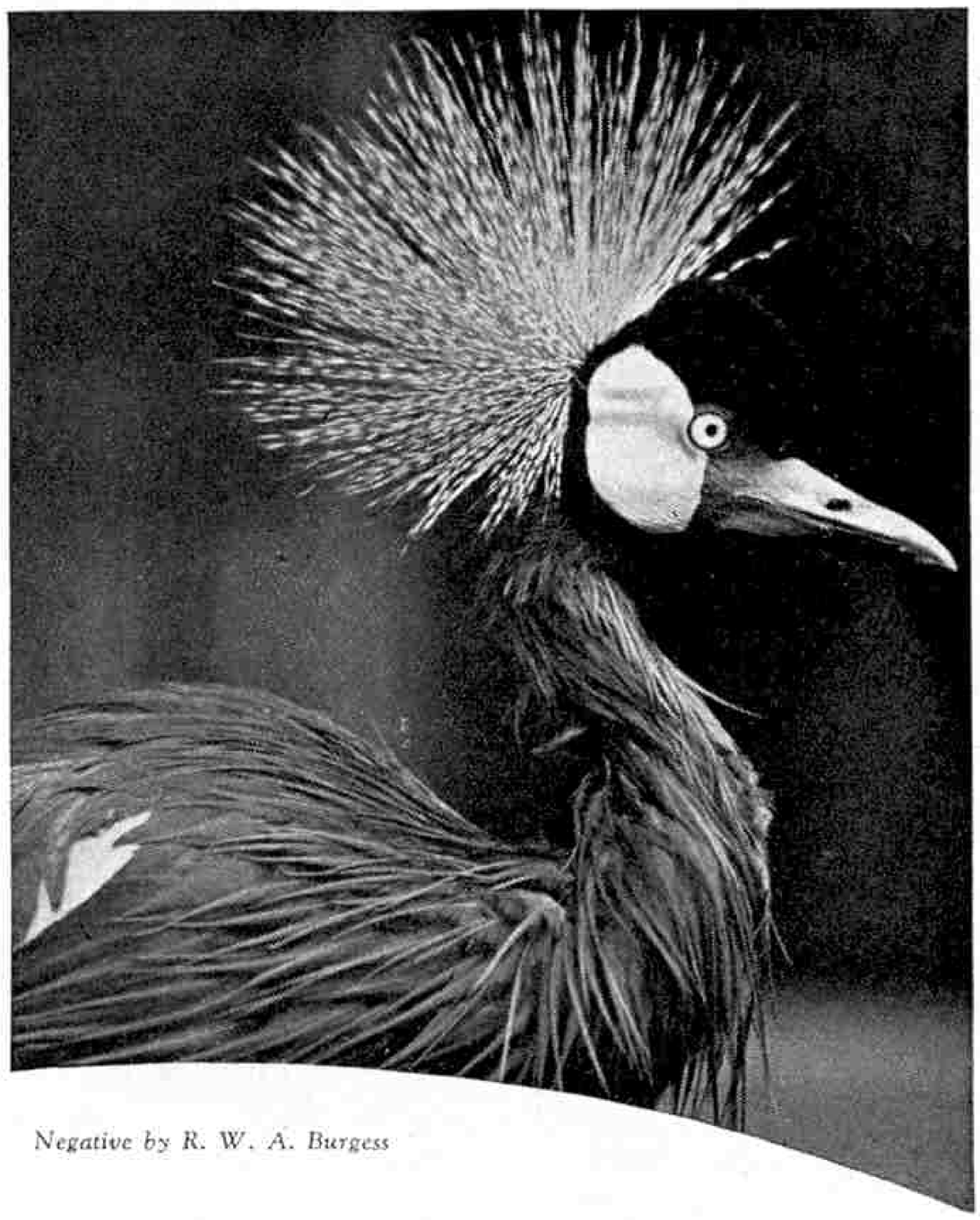

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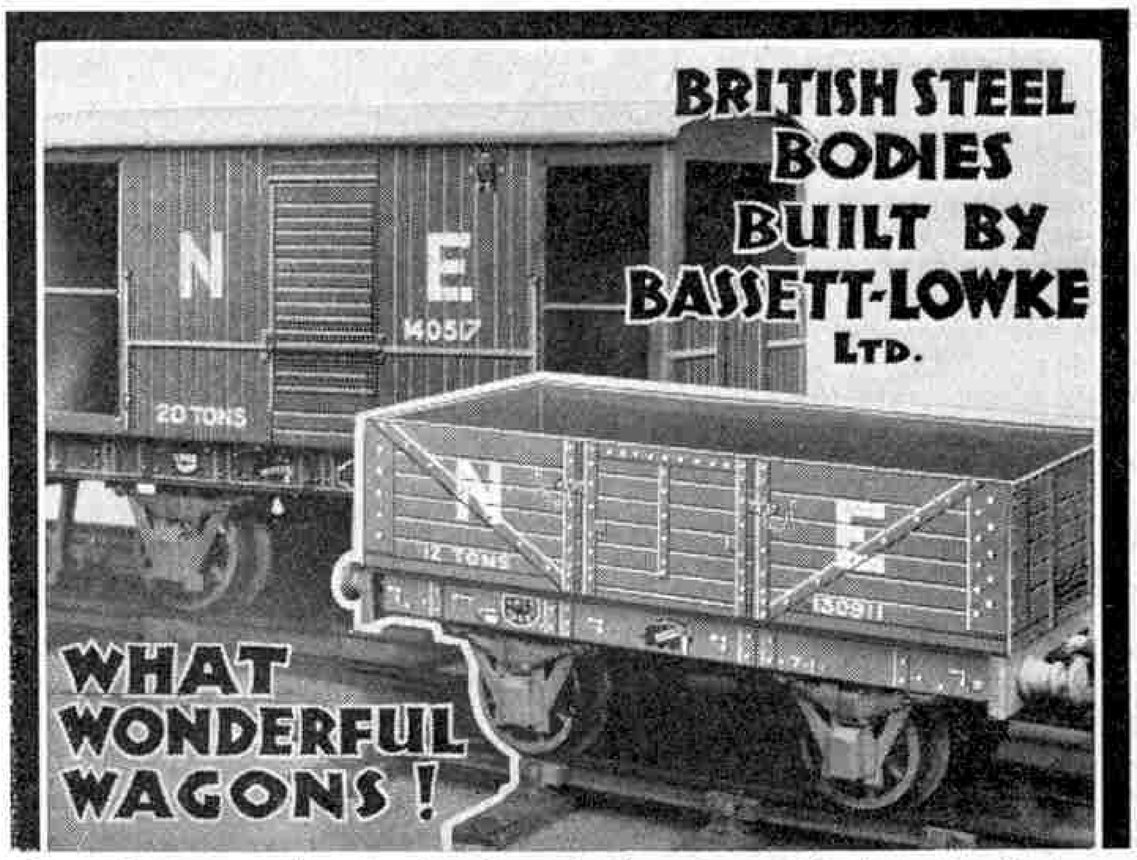

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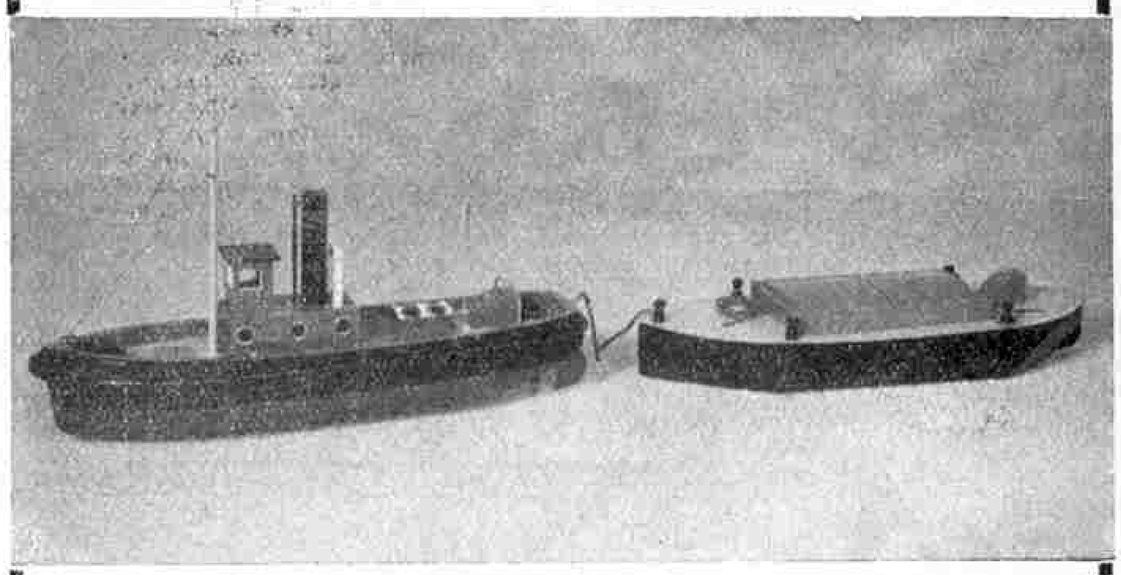

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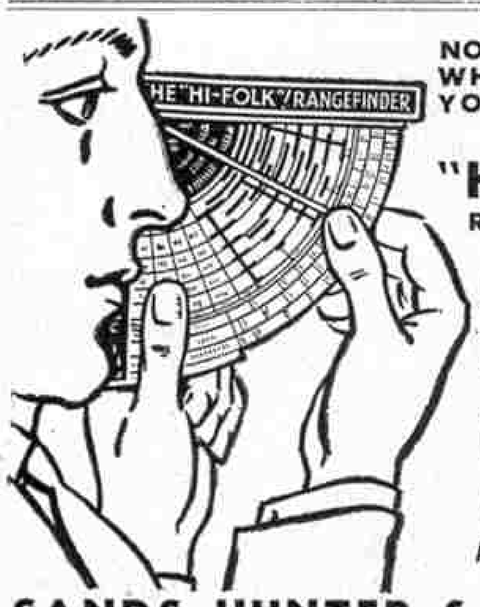

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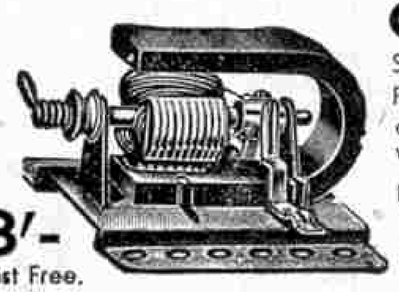

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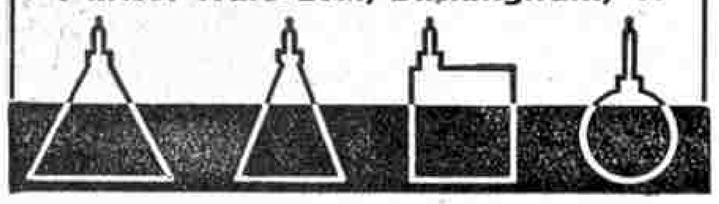

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Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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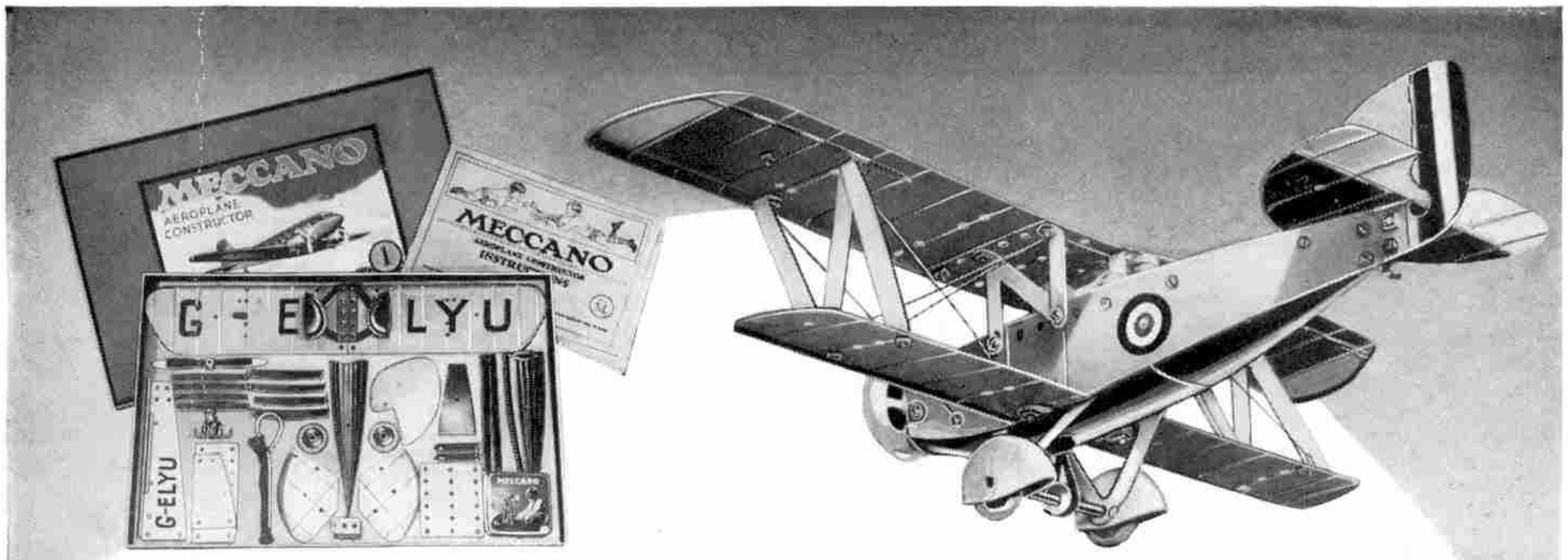

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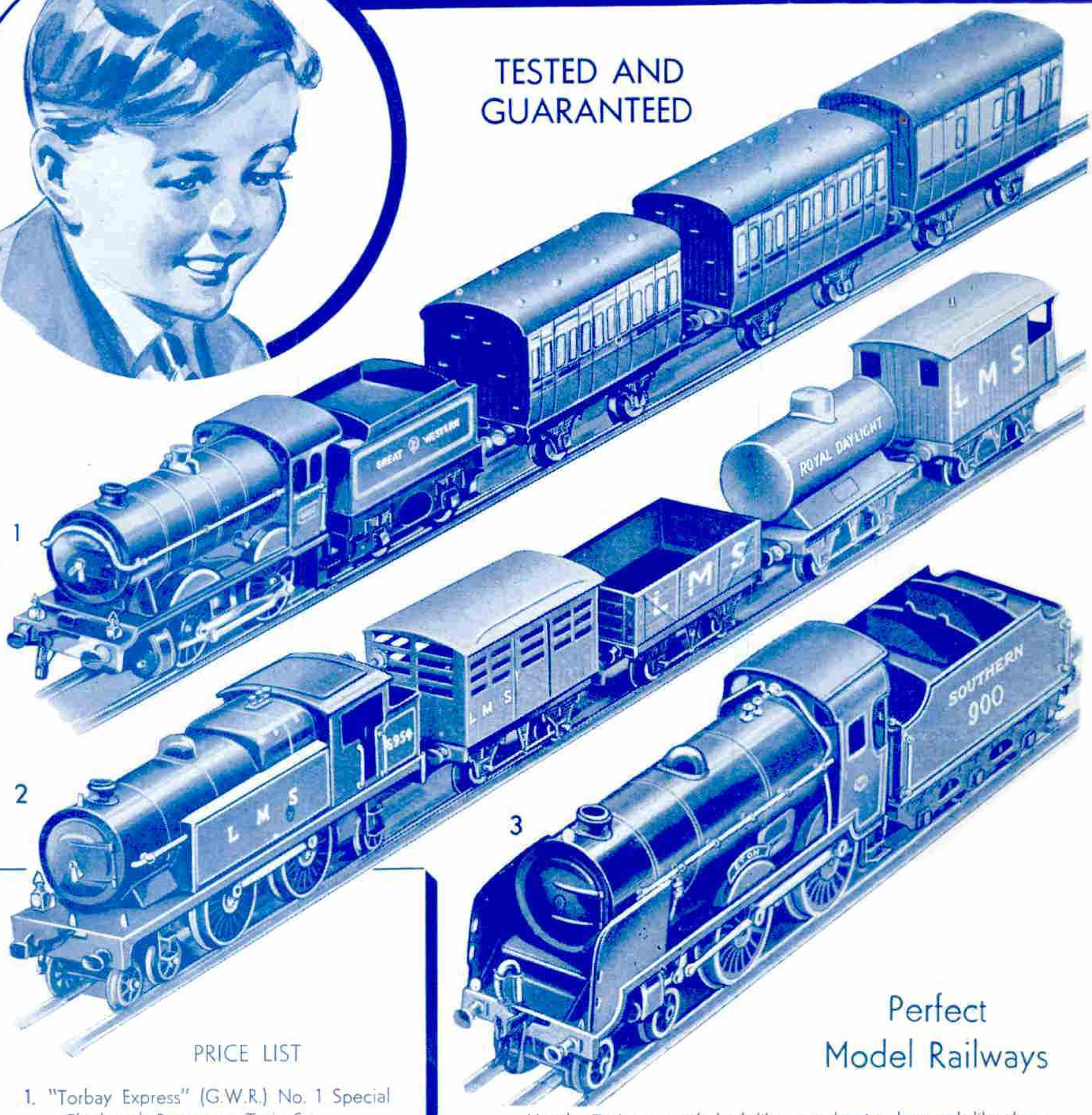

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